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ENCYCLOPÆDIA BRITANNICA.

Fordyce. FORDYCE, DAVID, an elegant and learned writer, was born at Aberdeen in the year 1711. Having received the early part of his education at the grammar ſchool, at the age of 13 he was entered at the Greek claſs in Mariſchal college, Aberdeen; in 1728 he took the degree of A. M. and was afterwards, in 1742, admitted profeſſor of philoſophy in the ſame college. He was originally deſigned for the miniſtry; to prepare himſelf for which was the whole object of his ambition, and for a courſe of years the whole purpoſe of his ſtudies. How well he was qualified to appear in that character, appears from his "Theodorus, a dialogue concerning the art of preaching." Having finiſhed this work, he went abroad in 1750 on his travels, in order to obtain freſh ſtores of knowledge: but after a ſucceſsful tour through ſeveral parts of Europe, he was, on his return home, unfortunately caſt away in a ſtorm on the coaſt of Holland, in the 41ſt year of his age. Beſides the above work, he wrote Dialogues on Education, 8vo, and a Treatiſe of Moral Philoſophy, publiſhed in the Preceptor. The third edition of his Theodorus was publiſhed in London, in 1751, after his death, by his brother James, the ſubject of the following article.

FORDYCE, *James*, a Scotch divine, juſtly eſteemed for his piety and ingenuity, as well as for his pulpit eloquence, was born at Aberdeen in the year 1720. He received his claſſical education at the public grammar ſchool, and went afterwards to the Mariſchal college, where he went through the uſual courſe of ſtudies neceſſary for a miniſter of the goſpel. His natural abilities were excellent, and he improved to the utmoſt the favourable opportunities he enjoyed at the univerſity, which made him be conſidered as well qualified for a preacher of the goſpel at an early period of life. His firſt appointment was that of ſecond miniſter in the church of Brechin in the county of Angus, after which he accepted of a call to Alloa near Stirling. The people of that pariſh were prepoſſeſſed in favour of another, and prejudiced againſt Mr Fordyce, which could not fail to be a moſt unpleaſant circumſtance; yet by his impreſſive delivery, and indefatigable attention to every part of his miniſterial duty, he ſoon changed their prejudice into eſteem, and their eſteem into admiration.

During his reſidence at Alloa, he drew on him the notice of the public by three excellent ſermons; the firſt on the eloquence of the pulpit, the ſecond on the method of promoting edification by public inſtitutions, and

the third on the deluſive and bloody ſpirit of popery, preached before the ſynod of Perth and Stirling. But Fordyce. ſtill greater wonder and aſtoniſhment were excited by his inimitable ſermon on the folly, infamy, and miſery of unlawful pleaſure, preached before the general aſſembly of the church of Scotland in 1760. It contains ſuch maſterly compoſition with reſpect to deſcription, ſpirit, and elegance, and was delivered with ſuch uncommon ſolemnity, animation, and pathos, that it filled his learned fathers and brethren with aſtoniſhment, and juſtly raiſed him to unrivalled eminence among his clerical cotemporaries. About this time he was complimented with a degree of doctor in divinity by the univerſity of Glaſgow, probably on account of the fame he acquired by this extraordinary ſermon.

The friends of Dr Fordyce being moſtly in London, he was invited to that metropolis to be the colleague of Dr Lawrence, miniſter of a reſpectable congregation in Monkwell-ſtreet, on whoſe death, which happened a few months after, Dr Fordyce became once more famous for his pulpit eloquence, always preaching to overflowing audiences. This popularity he juſtly deſerved, whether with reſpect to the elegance of his compoſitions, or their happy tendency to impreſs the heart with the love of virtue and religion. Yet even Dr Fordyce lived to ſee his popularity on the decline; for ſuch as attend a place of worſhip from mere motives of curioſity muſt have fickle and unſtable minds, changing their preachers as they do their dreſs, loving to be where others are, of doing what others do, and of admiring what others admire, for they have no taſte of their own.

His pews were thinned from another cauſe, which was the failure of a younger brother, an extenſive banker, which ruined many of the doctor's conſtant hearers and moſt liberal ſupporters. Although the doctor could not be reaſonably blamed for the failure of his brother, yet it is certain that it brought a degree of odium on the whole family. Another cauſe of the diminution of his hearers was an unhappy difference between him and Mr Toller his colleague, which happened in the year 1755, and which ended in a diviſion of the congregation, many reſpectable families following Mr Toller to another place of worſhip. Soon after this he declined officiating as a miniſter, the impaired ſtate of his health rendering ſuch a ſtep neceſſary. The beſt ſpecimen of pulpit eloquence which perhaps ever came from his pen, was delivered at the ordina-

Fordyce.

tion of his ſucceſſor Mr James Lindſay, and highly meriting the attentive peruſal of every clergyman. The remainder of his valuable life he ſpent chiefly at a retirement in Hampſhire in the vicinity of the earl of Bute, with whom he lived in the greateſt intimacy, and to whoſe valuable library he had unlimited acceſs. He afterwards went to Bath, where he ſuffered much from an aſthmatic affection, but bore it with the heroic fortitude of a Chriſtian, and expired without a groan on the firſt of October 1796, in the 76th year of his age.

The doctor's writings diſcover much genius and imagination, a correct taſte, extenſive knowledge of the world, and a happy method of engaging the attention; full of ardent piety, and a zeal for the intereſts of genuine virtue. His religious ſentiments were manly and rational; in private life he was highly amiable, and deſervedly beloved by all who knew him. He was author of Sermons to Young Women, in two volumes 12mo, which have been tranſlated into ſeveral European languages; A Sermon on the Character and Conduct of the Female Sex; Addreſſes to Young Men, in two volumes 12mo; Addreſſes to the Deity; A volume of Poems; A diſcourſe on Pain, and Additions to his brother's Temple of Virtue.

FORDYCE, *George*, a writer and lecturer on medicine, was born in the year 1736, and ſtudied at the univerſity of Aberdeen, where he obtained the literary degree of M. A. at the early age of 14, perhaps not altogether owing to the ſuperior caſt of his genius, or the extent of his acquirements, which could not be extraordinary in a boy of his years. He became apprentice to an uncle who practiſed ſurgery at Uppingham in Rutlandſhire, when he was only 15, and afterwards went to the univerſity of Edinburgh, where his diligence and progreſs attracted the attention of Dr Cullen, at that time profeſſor of chemiſtry, who very generouſly promoted his improvement. He graduated in 1758, when only 22 years of age; after which he reſided one winter at Leyden. The greater part of his patrimony being ſpent on his education, he reſolved to try his fortune in London, where he ſettled in the year 1759. He commenced with a courſe of lectures on chemiſtry; and although his encouragement at firſt was by no means flattering, yet he ſteadily and diligently perſevered, notwithſtanding ſuch unfavourable appearances, till his literary merit began gradually to be diſcovered and properly appreciated. A number of young men who came to ſtudy in London did not think that their medical courſe was complete, without availing themſelves of the benefit of his courſe of lectures.

In the year 1768, he publiſhed his Elements of the Practice of Phyſic, which formed the text book of his medical courſe, and were much read as a valuable epitome of medicine. His private practice was very reſpectable; and in the year 1770 his medical reputation was ſo great, that he was choſen phyſician to the hoſpital of St Thomas, although he had to contend againſt a gentleman with very powerful intereſt; and his merit as a man of ſcience made him a member of the Royal Society in 1776. He was choſen in 1787 a fellow of the College of Phyſicians; and his chemical knowledge was of ſingular importance to that body for a new edition of their Pharmacopœia. By the influence of his connections, but probably more ſo by his literary reputation, he was appointed to furniſh the navy with ſour-krout, which we believe he executed with advantage both to himſelf and the public.

Fordyce || Foreigner.

His conſtitution diſcovered ſymptoms of premature decay, yet he continued to diſcharge his profeſſional duties till he fell a victim to an irregular gout, and a water in his cheſt, on the 25th of June 1802, in the 66th year of his age. If his lectures wanted the charms of an eloquent delivery, he made ample compenſation by the originality of his ideas and his ſcientific information, and by a memory which was uncommonly retentive. His works are, Elements of Agriculture and Vegetation; Of the Practice of Phyſic; A Treatiſe on the Digeſtion of Food; and Four Diſſertations on Fever.

FORE, applied to a ſhip, denotes all that part of a ſhip's frame and machinery which lies near the ſtem.

Fore and aft, is uſed for the whole ſhip's length, or from end to end.

FORECASTLE *of a Ship*, that part where the foremaſt ſtands. It is divided from the reſt by a bulkhead.

FOREIGN, ſomething extraneous, or that comes from abroad. The word is formed from the Latin *fores*, "doors;" or *foris*, "out of doors;" or *forum*, "market," &c.

Foreign miniſter, foreign prince, foreign goods, &c. are thoſe belonging to other nations. See MINISTER, &c.

Foreign to the purpoſe, ſignifies a thing remote or impertinent.

FOREIGN, in the *Engliſh Law*, is uſed in various ſignifications. Thus,

FOREIGN Attachment, is an attachment of the goods of foreigners found within a city or liberty, for the ſatisfaction of ſome citizen to whom the foreigner is indebted; or it ſignifies an attachment of a foreigner's money in the hands of another perſon.

FOREIGN Kingdom, a kingdom under the dominion of a foreign prince.

At the inſtance of an ambaſſador or conſul, any offender againſt the laws here may be ſent for hither from a foreign kingdom to which he hath fled. And, where a ſtranger of Holland, or any foreign country, buys goods at London, for inſtance, and there gives a note under his hand for payment, and then goes away privately into Holland; in that caſe, the ſeller may have a certificate from the lord mayor, on the proof of the ſale and delivery of ſuch goods, whereupon a proceſs will be executed on the party in Holland.

FOREIGN Oppoſer, or *Appoſer*, an officer in the exchequer that oppoſes or makes a charge on all ſheriffs, &c. of their green wax; that is to ſay, fines, iſſues, amerciaments, recognizances, &c.

FOREIGN Plea, ſignifies an objection to the judge of the court, by refuſing him as incompetent, becauſe the matter in queſtion is not within his juriſdiction.

FOREIGN Seamen, ſerving two years on board Britiſh ſhips, whether of war, trade, or privateers, during the time of war, ſhall be deemed natural-born ſubjects.

FOREIGNER, the natural-born ſubject to ſome foreign prince.

Foreigners, though made denizens, or naturalized, are

Foreigner || Fore-locks.

are diſabled to bear any office in government, to be of the privy council, or members of parliament, &c.— This is by the acts of the ſettlement of the crown.— Such perſons as are not freemen of a city or corporation, are alſo called *foreigners*, to diſtinguiſh them from the members of the ſame.

FOREJUDGER, in *Law*, ſignifies a judgment whereby one is deprived or put by a thing in queſtion.

To be *forejudged the court*, is where an officer or attorney of any court is expelled the ſame for malpractice, or for not appearing to an action on a bill filed againſt him, &c. And where an attorney of the common-pleas is ſued, the plaintiff's attorney delivers the bill to one of the criers of the court, who calls the attorney defendant, and ſolemnly proclaims aloud, that, if he does not appear thereto, he will be forejudged: likewiſe a rule is given by the ſecondary for his appearance; and if the attorney appears not in four days, then the clerk of the warrants ſtrikes ſuch an attorney off the roll of attorneys; after which he becomes liable to be arreſted like any other perſon; but where an attorney is forejudged, he may be reſtored on clearing himſelf from his contumacy, and making ſatisfaction to the plaintiff, &c.

FORELAND, or FORENESS, in *Navigation*, a point of land jutting out into the ſea.

North FORELAND, in the iſle of Thanet, Kent, of which it is the N. E. point, is the promontory aſcertained by act of parliament to be the moſt ſouthern part of the port of London, which is thereby extended N. in a right line to the point called the Naſe on the coaſt of Eſſex, and forms what is properly called the Mouth of the Thames. A ſea-mark was erected here by the Trinity-houſe corporation at the public expence, which is a round brick tower, near 80 feet high. The ſea gains ſo much upon the land here by the winds at S. W. that within the memory of ſome that are living about 30 acres of land have been loſt in one place. All veſſels that paſs on the ſouth ſide of this head-land are ſaid to enter the Channel, which is the name for the narrow ſea between England and France; and all the towns or harbours between London and this place, whether on the Kentiſh or Eſſex ſhore, are called members of the port of London.

South FORELAND, in Kent, a head-land forming the eaſt point of the Kentiſh ſhore; and called *South*, in reſpect to its bearing from the other Foreland, which is about ſix miles to the north. Its ſituation is of great ſecurity to the Downs, the road between both, which would be a very dangerous road for ſhips, did not this point break the ſea off, that would otherwiſe come rolling up from the weſt to the Flats or banks of ſand, which for three leagues together, and at about a league or a league and a half from the ſhore, run parallel with it, and are dry at low water; ſo that theſe two capes breaking all the force of the ſea on the S. E. and S. W. make the Downs accounted a good road, except when the wind blows exceſſively hard from S. E. E. by N. or E. N. E. when ſhips in the Downs are driven from their anchors, and often run aſhore, or are forced on the ſands, or into Sandwich bay or Ramſgate pier.

FORE-LOCKS, in the ſea language, little flat wedges made of iron, uſed at the end of bolts, to keep them from flying out of their holes.

FOREMAST of a SHIP, a large round piece of timber, placed in her fore part or fore-caſtle, and carrying the fore-ſail and fore-top-ſail yards. Its length is uſually $\frac{8}{9}$ of the main-maſt, and the fore-top-gallant-maſt is $\frac{1}{2}$ the length of the fore-top. Foremaſt, Foreſt.

FOREMAST Men, are thoſe on board a ſhip that take in the top-ſails, ſling the yards, furl the ſails, bowſe, trice, and take their turn at the helm, &c.

FOREST, in *Geography*, a huge wood; or, a large extent of ground covered with trees. The word is formed of the Latin *foreſta*, which firſt occurs in the capitulars of Charlemagne, and which itſelf is derived from the German *froſt*, ſignifying the ſame thing. Spelman derives it from the Latin *foris reſtat*, by reaſon foreſts are out of towns. Others derive *foreſta* from *feris*, q. d. *Foreſta*, *quod ſit tuta ſtatio ferarum*, as being a ſafe ſtation or abode for wild beaſts.

The Caledonian and Hercynian foreſts are famous in hiſtory. The firſt was a celebrated retreat of the ancient Picts and Scots: The latter anciently occupied the greateſt part of Europe; particularly Germany, Poland, Hungary, &c. In Cæſar's time it extended from the borders of Alſatia and Switzerland to Tranſylvania; and was computed 60 days journey long, and 9 broad: ſome parts or cantons thereof are ſtill remaining.

The ancients adored foreſts, and imagined a great part of their gods to reſide therein: temples were frequently built in the thickeſt foreſts; the gloom and ſilence whereof naturally inſpire ſentiments of devotion, and turn men's thoughts within themſelves.

For the like reaſon, the Druids made foreſts the place of their reſidence, performed their ſacrifices, inſtructed their youth, and gave laws therein.

FOREST, in *Law*, is defined, by Manwood, a certain territory of woody grounds and fruitful paſtures, privileged for wild beaſts and fowls of foreſt, chaſe, and warren, to reſt and abide under the protection of the king, for his princely delight; bounded with unremoveable marks and meres, either known by matter of record or preſcription; repleniſhed with wild beaſts of venery or chaſe, with great coverts of vert for the ſaid beaſts; for preſervation and continuance whereof, the vert and veniſon, there are certain particular laws, privileges, and officers.

Foreſts are of ſuch antiquity in England, that, excepting the New Foreſt in Hampſhire, erected by William the Conqueror, and Hampton Court, erected by Henry VIII. it is ſaid, that there is no record or hiſtory which makes any certain mention of their erection, though they are mentioned by ſeveral writers and in ſeveral of our laws and ſtatutes. Ancient hiſtorians tell us, "that New foreſt was raiſed by the deſtruction of 22 pariſh churches, and many villages, chapels, and manors, for the ſpace of 30 miles together, which was attended with divers judgments on the poſterity of William I. who erected it: for William Rufus was there ſhot with an arrow, and before him Richard the brother of Henry I.; and Henry nephew to Robert, the eldeſt ſon of the Conqueror, did hang by the hair of the head in the boughs of the foreſt, like unto Abſalom." *Blount.*

Beſides the New foreſt, there are 68 other foreſts in England, 13 chaſes, and more than 700 parks: the four principal foreſts are New foreſt on the ſea, Shire-

Foreſt. wood foreſt on the Trent, Dean foreſt on the Severn, and Windſor foreſt on the Thames.

A foreſt in the hands of a ſubject is properly the ſame thing with a CHASE; being ſubject to the common law, and not to the foreſt laws. But a chaſe differs from a foreſt in that it is not encloſed: and likewiſe, that a man may have a chaſe in another man's ground as well as his own; being indeed the liberty of keeping beaſts of chaſe, or royal game therein, protected even from the owner of the land, with a power of hunting them thereon. See PARK.

The manner of erecting a foreſt is thus: Certain commiſſioners are appointed under the great ſeal, who view the ground intended for a foreſt, and fence it round; this commiſſion being returned into chancery, the king cauſeth it to be proclaimed throughout the county where the land lieth, that it is a foreſt; and prohibits all perſons from hunting there, without his leave. Though the king may erect a foreſt on his own ground and waſte, he may not do it on the ground of other perſons without their conſent; and agreements with them for that purpoſe ought to be confirmed by parliament.

A foreſt, ſtrictly taken, cannot be in the hands of any but the king; for no perſon but the king has power to grant a commiſſion to be juſtice in eyre of the foreſt: yet, if he grants a foreſt to a ſubject, and that on requeſt made in the chancery, that ſubject and his heirs ſhall have juſtices of the foreſt, in which caſe the ſubject has a foreſt in law.

A ſecond property of a foreſt is, the courts thereof. See *FOREST Courts*, *infra*.

A third property is the officers belonging to it, as the juſtices, warden, verderer, foreſter, argiſtor, regarder, keeper, bailiff, beadle, &c. See the articles AGISTOR, BAILIFF, FORESTER, &c.

By the laws of the foreſt, the receivers of treſpaſſes in hunting, or killing of the deer, if they know them to be the king's property, are principal treſpaſſers. Likewiſe, if a treſpaſs be committed in a foreſt, and the treſpaſſer dies, after his death it may be puniſhed in the lifetime of the heir, contrary to common law. Our Norman kings puniſhed ſuch as killed deer in any of their foreſts with great ſeverity; alſo in various manners; as by hanging, loſs of limbs, gelding, and putting out eyes. By *magna charta de foreſta*, it is ordained, that no perſon ſhall loſe life or member for killing the king's deer in foreſts, but ſhall be fined; and if the offender has nothing to pay the fine, he ſhall be impriſoned a year and a day, and then be delivered, if he can give ſecurity not to offend for the future, &c. 9 Hen. III. c. 1.

Before this ſtatute, it was felony to hunt the king's deer; and by a late act, perſons armed and diſguiſed, appearing in any foreſt, &c. if they hunt, kill, or ſteal any deer, &c. are guilty of felony. 9 Geo. I. c. 22.

He who has any licenſe to hunt in a foreſt or chaſe, &c. is to take care that he does not exceed his authority; otherwiſe he ſhall be deemed a treſpaſſer from the beginning, and be puniſhed for that fact, as if he had no licenſe. See further, the articles GAME, and *Game-LAW*.

Beaſts of the foreſt are, the hart, hind, buck, doe, boar, wolf, fox, hare, &c. The ſeaſons for hunting whereof are as follow, viz. that of the hart and buck begins at the feaſt of St John Baptiſt, and ends at Holy-rood-day; of the hind and doe, begins at Holy-rood, and continues till Candlemas; of the boar, from Chriſtmas to Candlemas; of the fox, begins at Chriſtmas, and continues till Lady-day; of the hare at Michaelmas, and laſts till Candlemas. Foreſt.

FOREST-Courts, courts inſtituted for the government of the king's foreſts in different parts of the kingdom, and for the puniſhment of all injuries done to the king's deer or veniſon, to the vert or greenſword, and to the covert in which ſuch deer are lodged. Theſe are the courts of ATTACHMENTS, of REGARD, of SWEINMOTE, and of JUSTICE-SEAT. 1. The court of attachments, woodmote, or forty days court, is to be held before the verderers of the foreſt once in every forty days; and is inſtituted to inquire into all offenders againſt vert and veniſon: who may be attached by their bodies, if taken with the mainour (or *mainœuvre*, *à manu*) that is, in the very act of killing veniſon, or ſtealing wood, or in the preparing ſo to do, or by freſh and immediate purſuit after the act is done; elſe they muſt be attached by their goods. And in this forty-days court the foreſters or keepers are to bring in their attachments, or preſentments *de viridi et venatione*; and the verderers are to receive the ſame, and to enrol them, and to certify them under their ſeals to the court of juſtice-ſeat or ſweinmote: for this court can only inquire of, but not convict, offenders. 2. The court of regard, or ſurvey of dogs, is to be holden every third year for the lawing or expeditation of maſtiffs; which is done by cutting off the claws of the fore feet, to prevent them from running after deer. No other dogs but maſtiffs are to be thus lawed or expeditated, for none other were permitted to be kept within the precincts of the foreſt; it being ſuppoſed that the keeping of theſe, and theſe only, was neceſſary for the defence of a man's houſe. 3. The court of ſweinmote is to be holden before the verderers, as judges, by the ſteward of the ſweinmote, thrice in every year; the ſweins or freeholders within the foreſt compoſing the jury. The principal juriſdiction of this court is, firſt, to inquire into the oppreſſions and grievances committed by the officers of the foreſt; "*de ſuper-oneratione foreſtariorum, et aliorum miniſtrorum foreſtæ; et de eorum oppreſſionibus populo regis illatis*:" and, ſecondly, to receive and try preſentments certified from the court of attachments againſt offences in vert and veniſon. And this court may not only inquire, but convict alſo; which conviction ſhall be certified to the court of juſtice-ſeat under the ſeals of the jury, for this court cannot proceed to judgment. But the principal court is, 4. The court of juſtice-ſeat, which is held before the chief juſtice in eyre, or chief itinerant judge, *capitalis juſticiarius in itinere*, or his deputy; to hear and determine all treſpaſſes within the foreſt, and all claims of franchiſes, liberties, and privileges, and all pleas and cauſes whatſoever therein ariſing. It may alſo proceed to try preſentments in the inferior courts of the foreſts, and to give judgment upon conviction of the ſweinmote. And the chief juſtice may therefore, after preſentment made or indictment found, but not before, iſſue his warrant to the officers of the foreſt to apprehend the offenders. It may be held every third year; and 40 days notice ought to be given of its ſitting. This court

Foreſt, Fore-ſtaff.

may fine and impriſon for offences within the foreſt, it being a court of record: and therefore a writ of error lies from hence to the court of king's bench, to rectify and redreſs any mal-adminiſtrations of juſtice; or the chief juſtice in eyre may adjourn any matter of law into the court of king's bench.

FOREST-Laws, are peculiar laws, different from the common law of England. Before the making of *Charta de Foreſta*, in the time of King John and his ſon Henry III. confirmed in parliament by 9 Henry III. offences committed therein were puniſhed at the pleaſure of the king in the ſevereſt manner. By this charter, many foreſts were diſafforeſted and ſtripped of their oppreſſive privileges, and regulations were made for the government of thoſe that remained; particularly, killing the king's deer was made no longer a capital offence, but only puniſhed by fine, impriſonment, or abjuration of the realm: yet even in the charter there were ſome grievous articles, which the clemency of later princes has ſince by ſtatute thought fit to alter *per aſſiſas foreſtæ*. And to this day, in treſpaſſes relating to the foreſt, *voluntas reputabitur pro facto*; ſo that if a man be taken hunting a deer, he may be arreſted as if he had taken a deer.

FOREST-Towns, in *Geography*, certain towns of Suabia in Germany, lying along the Rhine, and the confines of Switzerland, and ſubject to the houſe of Auſtria. Their names are *Rhineficld*, *Seckingen*, *Lauſenburg*, and *Waldſhut*.

FORE STAFF, an inſtrument uſed at ſea for taking the altitudes of heavenly bodies. The fore-ſtaff, called alſo *croſs-ſtaff*, takes its denomination hence, that the obſerver, in uſing it, turns his face towards the object; in oppoſition to the back-ſtaff, where he turns his back to the object.

The fore or croſs-ſtaff, conſiſts of a ſtraight ſquare ſtaff, graduated like a line of tangents, and four croſſes or vanes, which ſlide on it. The firſt and ſhorteſt of theſe vanes, is called the *ten croſs*, or *vane*, and belongs to that ſide of the inſtrument on which the diviſions begin at three degrees and end at ten. The next longer vane, is called the *thirty croſs*, belonging to that ſide of the ſtaff in which the diviſions begin at ten degrees and end at thirty, called the *thirty ſcale*. The next vane is called the *ſixty croſs*, and belongs to the ſide where the diviſions begin at twenty degrees and end at ſixty. The laſt and longeſt, called the *ninety croſs*, belongs to the ſide where the diviſions begin at thirty degrees and end at ninety.

The uſe of this inſtrument is to take the height of the ſun and ſtars, or the diſtance of two ſtars: and the ten, thirty, ſixty, or ninety croſſes, are to be uſed according as the altitude is greater or leſs; that is, if the altitude be leſs than ten degrees, the ten croſs is to be uſed; if above ten, but leſs than thirty, the thirty croſs is to be uſed, &c. *Note*, For altitudes greater than thirty degrees, this inſtrument is not ſo convenient as a quadrant or ſemicircle.

To obſerve an Altitude by this inſtrument.—Apply the flat end of the ſtaff to your eye, and look at the upper end of the croſs for the centre of the ſun or ſtar, and at the lower end for the horizon. If you ſee the ſky inſtead of the horizon, ſlide the croſs a little nearer the eye; and if you ſee the ſea inſtead of the horizon, ſlide the croſs farther from the eye; and thus continue moving till you ſee exactly the ſun or ſtar's centre by the top of the croſs, and the horizon by the bottom thereof. Then the degrees and minutes, cut by the inner edge of the croſs upon the ſide of the ſtaff peculiar to the croſs you uſe, give the altitude of the ſun or ſtar.

Fore-ſtaff || Forfar.

If it be the meridian altitude you want, continue your obſervation as long as you find the altitude increaſe, ſtill moving the croſs nearer to the eye. By ſubſtracting the meridian altitude thus found from 90 degrees, you will have the zenith diſtance. To work accurately, an allowance muſt be made for the height of the eye above the ſurface of the ſea, viz. for one Engliſh foot, 1 minute; for 5 feet, $2\frac{1}{2}$; for ten feet, $3\frac{1}{2}$; for 20 feet, 5; for 40 feet, 7, &c. Theſe minutes ſubtracted from the altitude obſerved, and added to the zenith diſtance obſerved, give the true altitude and zenith diſtance.

To obſerve the diſtance of two ſtars, or the moon's diſtance from a ſtar, by the fore-ſtaff.—Apply the inſtrument to the eye, and looking to both ends of the croſs, move it nearer or farther from the eye till you ſee the two ſtars, the one on the one end, and the other on the other end of the croſs; then the degrees and minutes cut by the croſs on the ſide proper to the vane in uſe give the ſtars diſtance.

FORESTALLER, a perſon who is guilty of foreſtalling. See the next article.

FORESTALLING, in *Law*, buying or bargaining for any corn, cattle, victuals, or merchandiſe, in the way as they come to fairs or markets to be ſold, before they get thither, with an intent to ſell the ſame again at a higher price.

The puniſhment for this offence, upon conviction at the quarter ſeſſions by two or more witneſſes, is, for the firſt time, two months impriſonment and the loſs of the goods, or the value; for the ſecond offence the offender ſhall be impriſoned ſix months, and loſe double the value of the goods; for the the third offence he ſhall ſuffer impriſonment during the king's pleaſure, forfeit all his goods and chattels, and ſtand on the pillory: but the ſtatute does not extend to maltſters buying barley, or to badgers licenſed.

FORESTER, a ſworn officer of the foreſt, appointed by the king's letters patent, to walk the foreſt at all hours, and watch over the vert and veniſon; alſo to make attachments and true preſentments of all treſpaſſes committed within the foreſt.

If a man comes into a foreſt in the night, a foreſter cannot lawfully beat him before he makes ſome reſiſtance; but in caſe ſuch a perſon reſiſts the foreſter, he may juſtify a battery. And a foreſter ſhall not be queſtioned for killing a treſpaſſer that, after the peace cried to him, will not ſurrender himſelf, if it be not done on any former malice; though, where treſpaſſers in a foreſt, &c. do kill a perſon that oppoſes them, it is murder in all, becauſe they were engaged in an unlawful act, and therefore malice is implied to the perſon killed.

FORETHOUGHT FELONY, in *Scots Law*, ſignifies premeditated murder. See MURDER.

FORFAR, a town of Scotland, and capital of the county of that name, ſituated in N. Lat. 56. 37. W. Long. 2. 55. This town, with Dundee, Cupar, Perth, and St Andrew's, jointly ſend one member to the Britiſh parliament. It ſtands in the great valley

Forfar. valley of Strathmore that runs from Perth north-eaſt to the ſea, almoſt in a ſtraight line, about 50 miles long and betwixt four and five miles broad, bounded on the ſouth ſide by gentle hills, and on the north by the Grampian mountains.

Forfar is a very ancient town, and was once a royal reſidence. Here Malcolm Canmore held his firſt parliament in 1057. The ruins of his palace are ſtill to be ſeen on the top of an artificial mount of a circular form, reſting upon a baſe of about three acres of ground, and riſing 50 feet high above the plain. The lake of Forfar, ſtretching two miles in length from eaſt to weſt, and half a mile in breadth, and covering the palace on the north, afforded not only a plentiful ſupply of water for every purpoſe, but alſo added to the ſtrength of the place. This lake which abounds with trout, pike, perch, and eel, has been greatly reduced by draining; and fine marl has been found in ſtrata from two to ſix and eight feet deep, with moſs below ten feet deep.

Within this lake were formerly two iſlands raiſed by art, with buildings on each; to which Margaret, Malcolm Canmore's queen, retired after the deceaſe of her huſband. Part of the ruins of theſe edifices are ſtill to be ſeen.

Little is known of Forfar till the middle of the 17th century, except an act paſſed in the 13th parliament of James VI. 21ſt July, 1593, in the following words, which affords a ſpecimen of the manners and language of the times: "Our ſoveraine Lorde, underſtanding that be acte and ordinance maid anent obſervation of the Sabbath-daie within this realme, the mercatte-daie of the burgh of Forfare, being the head burgh of the ſchire, quhilk was Sundaie, is taken from them; and his hieneſſe not willing that they in onie waies ſuld be prejudged hereby, therefore his hieneſſe, with adviſe of the eſtaites of this preſent parliament, alteris and changis their ſaid mercatte-daie from Sundaie to Fridaie, and willis the ſamen Fridaie oukly to be their mercatte-daie to them in all times hereafter; and the ſamin to ſtande with the like priveleges and freedomes as the Sundaie did of before." The market day has been long held on Saturday.

During the uſurpation of Oliver Cromwell, a detachment of his forces, after ſacking Dundee, came to Forfar and burnt all the public records of the place; and the only charter the town now has is one granted by Charles II. after his reſtoration, confirming all its ancient rights and privileges.

As an evidence of the ignorance and barbarity of the times, it appears from the records of the trials kept in the charter-cheſt of Forfar, that nine perſons were condemned and burnt here for witchcraft betwixt the years 1630 and 1662. Theſe innocent people were all tried by a ſpecial commiſſion from the lords of the privy council at Edinburgh; and although the commiſſion expreſsly diſcharged torturing them on purpoſe to extort a confeſſion of their guilt, yet, as it was then thought meritorious to obtain confeſſion of guilt by whatever means, many inhuman cruelties were exerciſed upon the unfortunate objects; particularly, an iron boot was drawn upon one of their legs, and a wedge driven with great force between it and the leg. Another inſtrument, ſtill carefully preſerved here, was likewiſe uſed, and is called the *witch bridle*. It is made of iron in the ſhape of a dog's collar, with two pikes on the inſide, about four inches diſtant and two and a half long. Theſe pikes were put into the mouth, and the collar afterwards buckled ſtrait on the back of the head, to which was affixed an iron chain, whereby the condemned perſons were led to the place of execution called the *Play-field*, about a quarter of a mile to the northward of the town. Forfar-ſhire.

The ſtreets of Forfar are rather irregular; but many of the houſes are neat and well built. Oſnaburgs and coarſe linens are manufactured here; and many of the inhabitants are employed in making a coarſe kind of ſhoes.

FORFAR-Shire, a county of Scotland, of which Forfar is the capital. Including Angus, Glenila, Gleneſk, and Glenproſſin, it extends between 40 and 50 miles from eaſt to weſt, and 16 where broadeſt, though in ſome places the breadth does not exceed five miles. On the north it is divided from the Brae of Mar by a ridge of the Binchinnan mountains; it is bounded on the ſouth by the frith of Tay and the Britiſh ocean, on the eaſt by Mearns, and on the weſt by Perthſhire. Part of the Grampian mountains runs through this county, which is agreeably diverſified with hill and dale. It produces ſome lead and iron, together with freeſtone, ſlate, and limeſtone. Coarſe linens and ſail cloth are the chief manufactures of the county. It is well watered with lakes, rivers, rivulets, and fountains, ſhaded with large foreſts, roughened with brown mountains, and waved with green hills interſperſed with fields and meadows, and adorned with fine ſeats and plantations. Their heaths and woods abound with hart, hind, roebuck, and moor game; their ſtreams are ſtocked with trout and ſalmon. Their hills are covered with flocks of ſheep, and their fields afford plentiful harveſts of wheat and all ſorts of grain. The mountains to the weſt and north are inhabited by Highlanders: but the Lowlanders poſſeſs the towns and champaign country, and are remarkable for their politeneſs and hoſpitality.

The population of this county in 1801 amounted to 97,778. But in the following table is exhibited a view of its population, at two different periods.

	Pariſhes.	Population in 1755.	Population in 1790—1798.
1	Aberbrothwick	2098	4676
	Aberlemno	943	1033
	Airly	1013	865
	Arbirlot	865	1055
5	Auchterhouſe	600	600
	Barry	689	796
	Brechin	3181	5000
	Carmylie	745	700
	Carraldſtone	269	260
10	Cortachy	1233	1020
	Craig	935	1314
	Dun	657	500
	Dundee	12,477	23,500
	Dunnichen	653	872
15	Edzell	862	963
	Effie and Nevay	500	630
	Fearn	500	490
	Fernell	799	620
	Forfar	2450	4756
20	Glammis	1780	2040

Gleniſla

Forfarſhire, Forfeiture.

	Pariſhes.	Population in 1755.	Population in 1790---1798.
	Glenilla	1852	1018
	Guthrie	584	571
	Innerarity	996	929
	Inverkeilor	1286	1747
25	Kettins	1475	1100
	Kingoldrum	780	600
	Kinnell	761	830
	Kinnettles	616	621
	Kirkden	585	727
30	Kirrymuir	3409	4358
	Lentrathen	1165	900
	Lethnot	635	505
	Liff	1311	1790
	Lochlee	686	608
35	Logie Pert	696	999
	Lunan	208	291
	Mains	709	876
	Maryton	633	529
	Menmuir	743	900
40	Moneikie	1345	1278
	Monifeith	1421	1218
	Montroſe	4150	6194
	Muirhouſe	623	462
	Newtyle	913	594
45	Oathlaw	435	430
	Panbride	1259	1460
	Reſcobie	798	934
	Ruthven	280	220
	St Vigeans	1592	3336
50	Strathmartine	368	340
	Strickathro	529	672
	Taunadyce	1470	1470
53	Tealing	755	802
		68,297	91,001
			68,297
		Increaſe,	22,704

FORFEITURE, originally ſignifies a tranſgreſſion or offence againſt ſome penal law. The word is formed of the baſe Latin *foriſfactura;* whence *forfaitura* and *forfaictura*, and the French *forfait*. *Foriſfactura* comes of *foriſfacere;* which, according to Iſidore, ſignifies to "hurt or offend," *facere contra rationem;* and which is not improbably derived of *foris*, "out," and *facere*, "to do," q. d. an action out of rule or contrary to the rules. Borel will have *forfait* derived from the uſing of force or violence: Lobineau, in his gloſſary, will have *foriſfacta* properly to ſignify a mulct or amend, not a *forfeit;* which latter he derives from the Bas-Breton *forfed*, "a penalty."

But, with us, it is now more frequently uſed for the effect of ſuch tranſgreſſion; or the loſing ſome right, privilege, eſtate, honour, office, or effects, in conſequence thereof; than for the tranſgreſſion itſelf.

Forfeiture differs from *confiſcation*, in that the former is more general; while confiſcation is particularly applied to ſuch things as become forfeited to the king's exchequer; and goods confiſcated are ſaid to be ſuch as nobody claims.

Forfeitures may be either in *civil* or *criminal* caſes.

I. With reſpect to the firſt, a man that hath an eſtate for life or years, may forfeit it many ways, as well as by reaſon of felony; ſuch as alienation, claiming a greater eſtate than he hath, or affirming the reverſion to be in a ſtranger, &c. When a tenant in tail makes leaſes not warranted by the ſtatute; a copyholder commits waſte, refuſes to pay his rent, or do ſuit of court; and where an eſtate is granted upon condition, on non-performance thereof, &c. they will make a forfeiture. Forfeiture.

Entry for a forfeiture ought to be by him who is next in reverſion, or remainder, after the eſtate forfeited. As if a tenant for life or years commits a forfeiture, he who has the immediate reverſion or remainder ought to enter, though he has the fee, or only an eſtate-tail.

II. Forfeiture in criminal caſes is twofold; of real, and perſonal eſtates.

1. As to real eſtates by ATTAINDER in high treaſon, a man forfeits to the king all his lands and tenements of inheritance, whether fee-ſimple or fee-tail; and all his rights of entry on lands and tenements, which he had at the time of the offence committed, or at any time afterwards, to be for ever veſted in the crown; and alſo the profits of all lands and tenements, which he had in his own right for life or years, ſo long as ſuch intereſt ſhall ſubſiſt. This forfeiture relates backwards to the time of the treaſon committed; ſo as to avoid all intermediate ſales and encumbrances, but not thoſe before the fact: and therefore a wife's jointure is not forfeitable for the treaſon of her huſband; becauſe ſettled upon her previous to the treaſon committed. But her dower is forfeited, by the expreſs proviſion of ſtatute 5 and 6 Edw VI. c. 11. And yet the huſband ſhall be tenant by courteſy of the wife's lands, if the wife be attainted of treaſon; for that is not prohibited by the ſtatute. But, though after attainder the forfeiture relates back to the time of the treaſon committed, yet it does not take effect unleſs an attainder be had, of which it is one of the fruits; and therefore, if a traitor dies before judgment pronounced, or is killed in open rebellion, or is hanged by martial law, it works no forfeiture of his lands: for he never was attainted of treaſon. But if the chief juſtice of the king's bench (the ſupreme coroner of all England) in perſon, upon the view of the body of him killed in open rebellion, records it and returns the record into his own court, both lands and goods ſhall be forfeited. *Blackſtone's Comment.*

The natural juſtice of the forfeiture or confiſcation of property, for treaſon, is founded on this conſideration: That he who hath thus violated the fundamental principles of government, and broken his part of the original contract between king and people, hath abandoned his connexions with ſociety, and hath no longer any right to thoſe advantages which before belonged to him purely as a member of the community; among which *ſocial* advantages, the right of transferring or tranſmitting property to others is one of the chief. Such forfeitures, moreover, whereby his poſterity muſt ſuffer as well as himſelf, will help to reſtrain a man, not only by the ſenſe of his duty, and dread of perſonal puniſhment, but alſo by his paſſions and natural affections; and will intereſt every dependent and relation he has to keep him from offending: according to that beautiful ſentiment of Cicero, "*nec vero me fugit quam ſit acerbum, parentum ſcelera filiorum pœnis lui; ſed hoc præclare*

Forfeiture. *præclare legibus comparatum eſt, ut caritas liberorum amiciores parentes reipublicæ redderet.*" And therefore Aulus Caſcellius, a Roman lawyer in the time of the triumvirate, uſed to boaſt that he had two reaſons for deſpiſing the power of the tyrants; his old age and his want of children; for children are pledges to the prince of the father's obedience. Yet many nations have thought, that this poſthumous puniſhment ſavours of hardſhip to the innocent; eſpecially for crimes that do not ſtrike at the very root and foundation of ſociety, as treaſon againſt the government expreſsly does. And therefore, although confiſcations were very frequent in the times of the earlier emperors, yet Arcadius and Honorius, in every other inſtance but that of treaſon, thought it more juſt, *ibi eſſe pœnam, ubi et noxa eſt;* and ordered, that "*peccata ſuos teneant auctores, nec ulterius progrediatur metus, quam reperiatur delictum;*" and Juſtinian alſo made a law to reſtrain the puniſhment of relations; which directs the forfeiture to go, except in the caſe of *crimen majeſtatis*, to the next of kin to the delinquent. On the other hand, the Macedonian laws extended even the capital puniſhment of treaſon, not only to the children, but to all the relations of the delinquent; and of courſe their eſtates muſt be alſo forfeited, as no man was left to inherit them. And in Germany, by the famous golden bull (copied almoſt *verbatim* from Juſtinian's code), the lives of the ſons of ſuch as conſpire to kill an elector are ſpared, as it is expreſſed by the emperor's *particular bounty*. But they are deprived of all their effects and rights of ſucceſſion, and are rendered incapable of any honour eccleſiaſtical and civil: to the end, that being always poor and neceſſitous, they may for ever be accompanied by the infamy of their father; may languiſh in continual indigence; and may find (ſays this mercileſs edict) their puniſhment in living, and their relief in dying."

In England, forfeiture of lands and tenements to the crown for treaſon is by no means derived from the feodal policy, but was antecedent to the eſtabliſhment of that ſyſtem in this iſland; being tranſmitted from our Saxon anceſtors, and forming a part of the ancient Scandinavian conſtitution. But in certain treaſons relating to the coin (which ſeem rather a ſpecies of the *crimen falſi* than the *crimen læſæ majeſtatis*), it is provided by ſome of the modern ſtatutes which conſtitute the offence, that it ſhall work no forfeiture of lands, ſave only for the life of the offenders; and by all, that it ſhall not deprive the wife of her dower. And, in order to aboliſh ſuch hereditary puniſhment entirely, it was enacted by ſtatute 7 Ann. c. 21. that, after the deceaſe of the late pretender, no attainder for treaſon ſhould extend to the diſinheriting of any heir, nor to the prejudice of any perſon, other than the traitor himſelf. By which the law of forfeitures for high treaſon would by this time have been at an end, had not a ſubſequent ſtatute intervened to give them a longer duration. The hiſtory of this matter is ſomewhat ſingular, and worthy of obſervation. At the time of the union, the crime of treaſon in Scotland was, by the Scots law, in many reſpects different from that of treaſon in England; and particularly in its conſequence of forfeitures of entailed eſtates, which was more peculiarly Engliſh; yet it ſeemed neceſſary, that a crime ſo nearly affecting government ſhould, both in its eſſence and conſequences, be put upon the ſame footing in both parts of the united kingdoms. In new modelling theſe laws, the Scots nation and the Engliſh houſe of commons ſtruggled hard, partly to maintain, and partly to acquire, a total immunity from forfeiture and corruption of blood; which the houſe of lords as firmly reſiſted. At length a compromiſe was agreed to, which is eſtabliſhed by this ſtatute, viz. that the ſame crimes, and no other, ſhould be treaſon in Scotland that are ſo in England; and that the Engliſh forfeitures and corruption of blood ſhould take place in Scotland till the death of the then pretender, and then ceaſe throughout the whole of Great Britain: the lords artfully propoſing this temporary clauſe, in hopes (it is ſaid) that the prudence of ſucceeding parliaments would make it perpetual. This has partly been done by the ſtatute 17 Geo. II. c. 39. made in the year preceding the late rebellion), the operation of theſe indemnifying clauſes being thereby ſtill farther ſuſpended till the death of the ſons of the pretender. Forfeiture.

In petit treaſon and felony, the offender alſo forfeits all his chattel intereſts abſolutely, and the profits of all freehold eſtates during life; and after his death all his lands and tenements in fee ſimple (but not thoſe in tail) to the crown, for a very ſhort period of time: for the king ſhall have them for a year and a day, and may commit therein what waſte he pleaſes; which is called the king's *year*, *day*, and *waſte*. Formerly the king had only a liberty of committing waſte on the lands of felons, by pulling down their houſes, extirpating their gardens, ploughing their meadows, and cutting down their woods. And a puniſhment of a ſimilar ſpirit appears to have obtained in the oriental countries, from the decrees of Nebuchadnezzar and Cyrus in the books of Daniel and Ezra; which, beſides the pain of death inflicted on the delinquents there ſpecified, ordain, "that their houſes ſhall be made a dunghill." But this tending greatly to the prejudice of the public, it was agreed in the reign of Henry I. of England, that the king ſhould have the profits of the land for one year and a day in lieu of the deſtruction he was otherwiſe at liberty to commit: and therefore *magna charta* provides, that the king ſhall only hold ſuch lands for a year and a day, and then reſtore them to the lord of the fee, without any mention made of waſte. But the ſtatute 17 Edward II. *de prerogativa regis*, ſeems to ſuppoſe, that the king ſhall have his year, day, *and* waſte; and not the year and day *inſtead of* waſte: which Sir Edward Coke (and the author of the Mirror before him) very juſtly look upon as an encroachment, though a very ancient one, of the royal prerogative. This year, day, and waſte, are now uſually compounded for; but otherwiſe they regularly belong to the crown: and after their expiration the land would naturally have deſcended to the heir (as in gavelkind tenure it ſtill does) did not its feudal quality intercept ſuch deſcent, and give it by way of eſcheat to the lord. Theſe forfeitures for felony do alſo ariſe only upon attainder; and therefore a *felo de ſe* forfeits no lands of inheritance or freehold, for he never is attainted as a felon. They likewiſe relate back to the time the offence was committed as well as forfeitures for treaſon, ſo as to avoid all intermediate charges and conveyances. This may be hard upon ſuch as have unwarily engaged with the offender; but the cruelty and reproach muſt lie on the part, not of the law, but

of

Forfeiture || Forge.

of the criminal: who has thus knowingly and diſhoneſtly involved others in his own calamities.

2. The forfeiture of goods and chattels accrues in every one of the high kinds of offence; in high treaſon, or miſpriſion thereof, petit treaſon, felonies of all ſorts whether clergyable or not, ſelf murder or felony *de ſe*, petty larceny, ſtanding mute, &c. For flight alſo, on an accuſation of treaſon, felony, or even petit larceny, whether the party be found guilty or acquitted, if the jury find the flight, the party ſhall forfeit his goods and chattels: for the very flight is an offence, carrying with it a ſtrong preſumption of guilt, and is at leaſt an endeavour to elude and to ſtifle the courſe of juſtice preſcribed by the law. But the jury very ſeldom find the flight: forfeiture being looked upon, ſince the vaſt increaſe of perſonal property of late years, as too large a penalty for an offence to which a man is prompted by the natural love of liberty.

There is a remarkable difference between the forfeiture of lands and of goods and chattels. (1.) Lands are forfeited upon *attainder*, and not before; goods and chattels are forfeited by *conviction*. Becauſe in many of the caſes where goods are forfeited, there never is any attainder; which happens only where judgment of death or outlawry is given: therefore, in thoſe caſes, the forfeiture muſt be upon conviction, or not at all; and, being neceſſarily upon conviction in thoſe, it is ſo ordered in all other caſes, for the law loves uniformity. (2.) The forfeiture of lands has relation to the time the fact was committed, ſo as to avoid all ſubſequent ſales and encumbrances: but the forfeiture of goods and chattels has no relation backwards; ſo that thoſe only which a man has at the time of conviction ſhall be forfeited. Therefore a traitor or felon may *bona fide* ſell any of his chattels, real or perſonal, for the ſuſtenance of himſelf and family between the fact and conviction; for perſonal property is of ſo fluctuating a nature, that it paſſes through many hands in a ſhort time; and no buyer could be ſafe, if he were liable to return the goods which he had fairly bought, provided any of the prior venders had committed a treaſon or felony. Yet if they be colluſively and not *bona fide* parted with, merely to defraud the crown, the law (and particularly the ſtatute 13 Eliz. c. 5.) will reach them; for they are all the while truly and ſubſtantially the goods of the offender: and as he, if acquitted, might recover them himſelf, as not parted with for a good conſideration; ſo, in caſe he happens to be convicted, the law will recover them for the king.

FORFEX, in Roman antiquity, was a way of drawing up an army in the form of a pair of ſheers. It was intended to receive the *cuneus* or wedge, if the enemy ſhould make uſe of that figure. For when the forfex opened to admit the wedge, they had an opportunity of defeating their deſign, and cutting them in pieces.

FORFICULA, the EARWIG, a genus of inſects belonging to the order of coleoptera. See ENTOMOLOGY *Index*.

FORGE, properly ſignifies a little furnace, wherein ſmiths and other artificers of iron or ſteel, &c. heat their metals red hot, in order to ſoften them and render them more malleable and manageable on the anvil.

An ordinary forge is nothing but a pair of bellows, the nozzle of which is directed upon a ſmooth area, on which coals are placed. The nozzle of a pair of bellows may be alſo directed to the bottom of any furnace, to excite the combuſtion of the coals placed there, by which a kind of forge is formed. In laboratories, there is generally a ſmall furnace conſiſting of one cylindrical piece, open at top, which has at its lower ſide a hole for receiving the nozzle of a double bellows. This kind of forge furnace is very convenient for fuſions, as the operation is quickly performed, and with few coals. In its lower part, two inches above the hole for receiving the nozzle of the bellows, may be placed an iron plate of the ſame diameter, ſupported upon two horizontal bars, and pierced near its circumference with four holes diametrically oppoſite to each other. By this diſpoſition, the wind of the bellows, puſhed forcibly under this plate, enters at theſe four holes; and thus the heat of the fire is equally diſtributed, and the crucible in the furnace is equally ſurrounded by it. This contrivance is uſed in the forge-furnaces for melting copper, with this difference only, that theſe furnaces are ſquare, which is a matter of no conſequence.

Forge || Forgery.

As the wind of bellows ſtrongly and rapidly excites the action of the fire, a forge is very convenient when a great heat is to be applied quickly: but it is not ſuitable when the heat is to be gradually increaſed.

The forge, or blaſt of bellows, is uſed in ſeveral operations in ſmall; as to fuſe ſalts, metals, ores, &c. It is alſo much uſed in works in the great, which require ſtrong heat, without much management; and chiefly in the ſmelting of ores, and fuſion of metallic matters.

FORGE is alſo uſed for a large furnace, wherein iron ore, taken out of the mine, is melted down: or it is more properly applied to another kind of furnace, wherein the iron-ore, melted down and ſeparated in a former furnace, and then caſt into ſows and pigs, is heated and fuſed over again, and beaten afterwards with large hammers, and thus rendered more ſoft, pure, ductile, and fit for uſe.

FORGE, in the train of artillery, is generally called a *travelling forge*, and may not be improperly called a portable ſmith's ſhop: at this forge all manner of ſmith's work is made, and it can be uſed upon a march as well as in camp. Formerly they were very ill contrived, with two wheels only, and wooden ſupporters to prop the forge for working when in the park. Of late years they are made with four wheels, which anſwers their purpoſe much better.

FORGE for red-hot Balls, is a place where the balls are made red hot before they are fired off: it is built about five or ſix feet below the ſurface of the ground, of ſtrong brick-work, and an iron grate, upon which the balls are laid, with a large fire under them.

FORGER, in *Law*, one guilty of FORGERY.

FORGERY, (from the French *forger*, i. e. *accudare*, *fabricare*, "to beat on an anvil, forge, or form,") may be defined at common law, to be "the fraudulent making or alteration of a writing, to the prejudice of another man's right:" for which the offender may ſuffer fine, impriſonment, and pillory. And alſo, by a variety of ſtatutes, a more ſevere puniſhment is inflicted on the offender in many particular caſes, which are ſo multiplied of late as almoſt to become general. We ſhall mention the principal inſtances.

By ſtatute 5 Eliz. c. 14. to forge or make, or knowingly

Forgery. ingly to publiſh or give in evidence, any forged deed, court-roll, or will, with intent to affect the right of real property, either freehold or copyhold, is puniſhed by a forfeiture to the party grieved of double coſts and damages; by ſtanding in the pillory, and having both his ears cut off, and his noſtrils ſlit and ſeared; by forfeiture to the crown of the profits of his lands, and by perpetual impriſonment. For any forgery relating to a term of years or annuity, bond, obligation, acquittance, releaſe, or diſcharge of any debt or demand of any perſonal chattels, the ſame forfeiture is given to the party grieved; and on the offender is inflicted the pillory, loſs of one of his ears, and half a year's impriſonment: the ſecond offence, in both caſes, being felony without benefit of clergy.

Beſides this general act, a multitude of others, ſince the Revolution (when paper credit was firſt eſtabliſhed), have inflicted capital puniſhment on the forging, altering, or uttering as true when forged, of any bank bills or notes, or other ſecurities; of bills of credit iſſued from the exchequer; of South Sea bonds, &c.; of lottery tickets or orders; of army or navy debentures; of Eaſt India bonds; of writings under ſeal of the London or royal exchange aſſurance; of the hand of the receiver of the pre-fines, or of the accountant-general and certain other officers of the court of chancery; of a letter of attorney or other power to receive or transfer ſtock or annuities; and on the perſonating a proprietor thereof, to receive or transfer ſuch annuities, ſtock or dividends: alſo on the perſonating, or procuring to be perſonated, any ſeamen or other perſon, entitled to wages or other naval emoluments, or any of his perſonal repreſentatives; and the taking, or procuring to be taken, any falſe oath in order to obtain a probate or letters of adminiſtration, in order to receive ſuch payments; and the forging, or procuring to be forged, and likewiſe the uttering or publiſhing, as true, of any counterfeited ſeaman's will or power; to which may be added, though not ſtrictly reducible to this head, the counterfeiting of Mediterranean paſſes under the hands of the lords of the admiralty, to protect one from the piratical ſtates of Barbary; the forging or imitating of any ſtamps to defraud the public revenue; and the forging of any marriage regiſter or licenſe: all which are, by diſtinct acts of parliament, made felonies without benefit of clergy. By ſtatutes 13 Geo. III. c. 52. and 59. forging or counterfeiting any ſtamp or mark to denote the ſtandard of gold and ſilver plate, and certain other offences of the like tendency, are puniſhed with tranſportation for 14 years. By ſtatute 12 Geo. III. c. 48. certain frauds on the ſtamp-duties, therein deſcribed, principally by uſing the ſame ſtamps more than once, are made ſingle felony, and liable to tranſportation for ſeven years. And the ſame puniſhment is inflicted by ſtatute 13 Geo. III. c. 38. on ſuch as counterfeit the common ſeal of the corporation for manufacturing plate glaſs (thereby erected), or knowingly demand money of the company by virtue of any writing under ſuch counterfeit ſeal.

There are alſo two other general laws with regard to forgery; the one 2 Geo. II. c. 25. whereby the firſt offence in forging or procuring to be forged, acting or aſſiſting therein, or uttering or publiſhing as true, any forged deed, will, bond, writing obligatory, bill of exchange, promiſſory note, indorſement or aſſignment thereof, or any acquittance or receipt for money or goods, with intention to defraud any perſon (or corporation), is made felony without benefit of clergy. And by ſtatute 7 Geo. II. c. 22. it is equally penal to forge, or cauſe to be forged, or utter as true, a counterfeit acceptance of a bill of exchange, or the number of any accountable receipt for any note, bill, or any other ſecurity for money, or any warrant or order for the payment of money, or delivery of goods. So that, through the number of theſe general and ſpecial proviſions, there is now hardly a caſe poſſible to be conceived, wherein forgery, that tends to defraud, whether in the name of a real or fictitious perſon, is not made a capital crime. Forgery ‖ Fork.

FORGING, in *Law*, the act of FORGERY.

FORGING, in ſmithery, the beating or hammering iron on the anvil, after having firſt made it red hot in the forge, in order to extend it into various forms, and faſhion it into various works. See FORGE.

There are two ways of forging and hammering iron. One is by the force of the hand, in which there are uſually ſeveral perſons employed, one of them turning the iron and hammering likewiſe, and the reſt only hammering. The other way is by the force of a water-mill, which raiſes and works ſeveral huge hammers beyond the force of man; under the ſtrokes whereof the workmen preſent large lumps or pieces of iron, which are ſuſtained at one end by the anvils, and at the other by iron chains faſtened to the ceiling of the forge. See MILL.

This laſt way of forging is only uſed in the largeſt works, as anchors for ſhips, &c. which uſually weigh ſeveral thouſand pounds. For the lighter works, a ſingle man ſerves to hold, heat, and turn with one hand, while he hammers with the other.

Each purpoſe the work is deſigned for requires its proper heat; for if it be too cold, it will not feel the weight of the hammer, as the ſmiths call it when it will not batter under the hammer; and if it be too hot, it will red ſear, that is, break or crack under the hammer.

The ſeveral degrees of heat the ſmiths give their irons, are, firſt, a blood-red heat; ſecondly, a white-flame heat; and thirdly, a ſparkling or welding heat.

FORISFAMILIATION, in *Law*. When a child, upon receiving a portion from his father, or otherwiſe, renounces his legal title to any further ſhare of his father's ſucceſſion, he is ſaid to be *foriſfamiliated*.

FORK, a well known inſtrument, conſiſting of a handle and blade, divided at the end into two or more points or prongs.

The *pitch-fork* is a large utenſil of this conſtruction, employed in hay-making, &c.

The *table fork*, an inſtrument now ſo indiſpenſable, did not come into uſe in England till the reign of James I. as we learn from a remarkable paſſage in Coryat. The reader will probably ſmile at the ſolemn manner in which this important diſcovery or innovation is related: "Here I will mention a thing that might have been ſpoken of before in diſcourſe of the firſt Italian townes. I obſerved a cuſtom in all theſe Italian cities and townes through the which I paſſed, that is not uſed in any other country that I ſaw in my travels, neither do I thinke that any other nation of Chriſten-

dome

Fork || Form.

dome doth uſe it, but only Italy. The Italians and alſo moſt ſtrangers that are commorant in Italy, doe always at their meals uſe a little forke when they eat their meate; for while with their knife which they hold in one hand they cut the meate out of the diſh, they faſten the forke which they hold in the other hand upon the ſame diſh, ſo that whatſoever he be that ſitting in the company of any others at meale ſhall unadviſedly touch the diſh of meat with his fingers from which all the table doe cut, he will give occaſion of offence unto the company as having tranſgreſſed the lawes of good manners, inſomuch that for his error he ſhall be at leaſt brow-beaten if not reprehended in wordes. This form of feeding I underſtand is generally uſed in all parts of Italy, their forkes for the moſt part being made of yronn, ſteele, and ſome of ſilver, but thoſe are uſed only by gentlemen. The reaſon of this their curioſity is, becauſe the Italian cannot by any means indure to have his diſh touched with fingers, ſeeing all men's fingers are not alike cleane. Hereupon I myſelf thought good to imitate the Italian faſhion by this forked cutting of meate, not only while I was in Italy, but alſo in Germany, and often times in England ſince I came home: being once quipped for that frequently uſing my forke, by a certain learned gentleman, a familiar friend of mine, Mr Lawrence Whitaker; who in his merry humour doubted not to call me a table *furcifer*, only for uſing a forke at feeding, but for no other cauſe."

FORLI, an ancient and conſiderable town of Italy, and capital of a territory of the ſame name, in Romagna, with a biſhop's ſee. The public ſtructures are very handſome; and it is ſeated in a fertile, healthy, and pleaſant country, 10 miles ſouth-eaſt of Faenza, and 45 north-eaſt of Florence. E. Long. 12. 1. N. Lat. 44. 28.

FORLORN-HOPE, in the military art, ſignifies men detached from ſeveral regiments, or otherwiſe appointed, to make the firſt attack in day of battle; or, at a ſiege, to ſtorm the counterſcarp, mount the breach, or the like. They are ſo called from the great danger they are unavoidably expoſed to; but the word is old, and begins to be obſolete.

FORM, in *Phyſics*, denotes the manner of being peculiar to each body; or that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other.

Mr Harris uſes the term *form* likewiſe in another ſenſe, as an efficient animating principle; to which he ſuppoſes Ovid to refer in the firſt lines of his Metamorphoſes.

> *In nova fert animus mutatas dicere* formas,
> *Corpora.*———

Theſe animating forms are of themſelves no objects either of the ear or of the eye; but their nature or character is underſtood in this, that were they never to exert their proper energies on their proper ſubjects, the marble on which the ſculptor exerciſes his art would remain for ever ſhapeleſs, and the harp from which the harper calls forth ſounds would remain for ever ſilent.

Thus, alſo, the animating form of a natural body is neither its organization nor its figure, nor any other of thoſe inferior forms which make up the ſyſtem of its viſible qualities: but it is the power, which is yet able to produce, preſerve, and employ theſe. It is the power, which firſt moves, and then conducts that latent proceſs, by which the acorn becomes an oak, and the embryo becomes a man; by which digeſtion is performed in plants and animals, and, which departing, the body ceaſes to live, and its members putrefy: and by which every being produces another like itſelf, and every ſpecies is continued. In animals, it is that higher faculty, which by employing the organs of ſenſe, peculiar to them as animals, diſtinguiſhes them as ſenſitive beings from vegetables; and it is alſo that more noble faculty, which by its own divine vigour, unaſſiſted perhaps with organs, makes and denominates him a being intellective and rational. So that Mr Harris reckons two ſorts of forms, thoſe which are paſſive elements, and thoſe which are efficient cauſes. And all of them agree in this, that they give to every being its peculiar and diſtinctive character: and on the whole he concludes, that form appears in part, to be an element, and in part an efficient cauſe, i. e. a cauſe which aſſociates the conſtituent elements of natural ſubſtances, and which employs them, when aſſociated, according to their various and peculiar characters. Form.

The philoſophers generally allow two principles of bodies: *matter*, as the common baſis or ſubſtratum of all; and *form*, as that which ſpecifies and diſtinguiſhes each; and which added to a quantity of common matter, determines or denominates it this or that; wood, or fire, or aſhes, &c.

Subſtantial forms ſeem to have been firſt broached by the followers of Ariſtotle, who thought matter, under different modes or modifications, not ſufficient to conſtitute different bodies; but that ſomething ſubſtantial was neceſſary to ſet them at a greater diſtance: and thus introduced ſubſtantial forms, on the footing of ſouls, which ſpecify and diſtinguiſh animals. What led to this erroneous notion were the circumſtances of life and death: For obſerving, that, as ſoon as the ſoul was departed out of a man, all motion, reſpiration, nutrition, &c. immediately ceaſed, they concluded, that all theſe functions depended on the ſoul, and conſequently that the ſoul was the form of the animal body, or that which conſtituted it ſuch: that the ſoul was a ſubſtance, independent of matter, no body doubted; and hence the forms of other bodies were concluded equally ſubſtantial. But to this it is anſwered, that though the ſoul be that by which a man is man, and conſequently is the form of the human body, as human; yet it does not follow, that it is properly the form of this body of ours, as it is a body; nor of the ſeveral parts thereof, conſidered as diſtinct from each other: For thoſe ſeveral parts have their proper forms ſo cloſely connected with their matter, that it remains inſeparable therefrom long after the ſoul has quitted the body; thus fleſh has the form of fleſh, bone of bone, &c. long after the ſoul is removed as well as before. The truth is, the body does not become incapable of performing its accuſtomed functions becauſe the ſoul has deſerted it; but the ſoul takes its leave, becauſe the body is not in a condition to perform its functions.

The ancient and modern corpuſcular philoſophers, therefore, with the Carteſians, exclude the notion of ſubſtantial forms; and ſhow, by many arguments, that

Form. the form is only the modus or manner of the body it is inherent in. And as there are only three primary modes of matter, viz. figure, reſt, or motion, with two others ariſing therefrom, viz. magnitude and ſituation, the form of all bodies they hold to conſiſt therein; and ſuppoſe the variations theſe modes are capable of, ſufficient to preſent all the variety obſervable in bodies.

Forms are uſually diſtinguiſhed into *eſſential* and *accidental*.

Eſſential. Though the five modes above mentioned, generally taken, be adventitious; yet to this or that body, *e. gr.* to fire or water, they are eſſential: thus, it is *accidental* to iron, to have this or that magnitude, figure, or ſituation, ſince it might exiſt in different ones; yet to a knife or hammer, the figure, magnitude, and poſition of parts, which conſtitute it a hammer or knife, are eſſential; and they cannot exiſt or be conceived without them. Hence it is inferred, that though there be no ſubſtantial, there are eſſential, forms; whereby the ſeveral ſpecies of bodies become what they are, and are diſtinguiſhed from all others.

Accidental forms, are thoſe really inherent in bodies, but in ſuch manner as that the body may exiſt in all its perfection without them. Such as whiteneſs in a wall, heat in water, a figure of a man in wax, &c.

FORM is alſo uſed, in a moral ſenſe, for the manner of being or doing a thing according to rules: thus we ſay, a form of government, a form of argument, &c.

FORM, in *Law*, the rules eſtabliſhed and requiſite to be obſerved in legal proceedings.—The formal part of the law, or method of proceeding, cannot be altered but by parliament; for if once theſe outworks were demoliſhed, there would be an inlet to all manner of innovation in the body of the law itſelf.

FORM, in carpentry, is uſed to denote the long ſeats or benches in the choirs of churches or in ſchools, for the prieſts, prebends, religious, or ſcholars, to ſit on. Du Cange takes the name to be derived from hence, that the backs of the ſeats were anciently enriched with figures of painting and ſculpture, called in Latin *formæ et typi*. In the life of St William of Roſchild, we meet with *forma* as ſignifying a ſeat for an eccleſiaſtic, or religious, in a choir; and in that of St Lupicin, we have formula in the ſame ſenſe. In the rule of the monaſtery of St Cæſarea, the man who preſides over the choir is called *primiceria*, *vel formari*.

At ſchools, the word *form* is frequently applied to what is otherwiſe termed a *claſs*. See CLASS.

FORM alſo denotes the external appearance or ſurface of a body, or the diſpoſition of its parts as to the length, breadth, and thickneſs.

FORM is alſo uſed among mechanics, for a ſort of mould wherein any thing is faſhioned or wrought.

Printer's FORM, an aſſemblage of letters, words, and lines, ranged in order, and ſo diſpoſed into pages by the compoſitor; from which, by means of ink and a preſs, the printed ſheets are drawn.

Every form is encloſed in an iron cheſs, wherein it is firmly locked by a number of pieces of wood; ſome long and narrow, and others of the form of wedges. There are two forms required for every ſheet, one for each ſide; and each form conſiſts of more or fewer pages according to the ſize of the book. Form || Forman.

Hatter's FORM, is a large block or piece of wood, of a cylindrical figure; the top thereof rounded, and the bottom quite flat. Its uſe is, to mould or faſhion the crown of the hat, after the matter thereof has been beaten and fulled.

Papermaker's FORM, is the frame or mould wherein the ſheets are faſhioned. See PAPER.

FORMA PAUPERIS, in *Law*, is when a perſon has juſt cauſe of ſuit, but is ſo poor that he cannot defray the uſual charges of ſuing at law or in equity; in which caſe, on making oath that he is not worth 5l. in the world, on all his debts being paid, and producing a certificate from ſome lawyer that he has good cauſe of ſuit, the judge will admit him to ſue in *forma pauperis*; that is, without paying any fee to counſellors, attorneys, or clerk: the ſtatute 11 Hen. VII. c. 12. having enacted, that counſel and attorneys, &c. ſhall be aſſigned to ſuch poor perſons *gratis*. Where it appears that any pauper has ſold or contracted for the benefit of his ſuit whilſt it is depending in court, ſuch cauſe ſhall be thenceforth totally diſmiſſed; and a perſon ſuing *in forma pauperis* ſhall not have a new trial granted him, but is to acquieſce in the judgment of the court.

FORMAL, ſomething belonging to or conſtituting the form of a thing. See FORM.

FORMALITY, the quality of a form, or formula; or that which conſtitutes and denominates them ſuch.

FORMALITY, as defined in the ſchools, is any manner wherein a thing is conceived; or a manner in any object, importing a relation to the underſtanding, whereby it may be diſtinguiſhed from another object. Thus, animality and rationality are formalities. The Scottiſts made great uſe of formalities, in oppoſition to the virtualities of the Thomiſts.

FORMALITIES, in matters of law, are frequently uſed for the formulas themſelves, or the rules preſcribed for judiciary proceedings. In contracts of ſtrict law, all the formalities muſt be ſtrictly obſerved: an omiſſion of the leaſt formality may ruin the whole convention.

The term is alſo uſed for a certain order or decorum to be obſerved.

FORMAN, ANDREW, archbiſhop of St Andrew's, carl of Pittenweem, and of Cottingham in England, one of the lords of the regency appointed by the ſtates during the minority of King James V. of Scotland, legate à latere, primate of all the kingdom of Scotland, and archbiſhop of Bourges in France, was deſcended from the family of the Formans of Hutton in the ſhire of Berwick, and is conſidered to have been one of the beſt ſtateſmen of the age in which he lived. He was employed in 1501, along with Robert Blackader, archbiſhop of Glaſgow, and Patrick earl of Bothwell, to negotiate a match between Ja. IV. of Scotland and Margaret eldeſt daughter of Hen. VII. of England, which next year was ratified by the Scottiſh ambaſſadors. He was afterwards frequently employed as Scots ambaſſador to Rome, England, and France, upon the moſt important occaſions. In 1514, he was tranſlated from the ſee of Moray, to which he had been appointed in 1502, to that of St Andrew's. During the time of his

Forman. his poſſeſſing the former, he was employed as mediator betwixt Pope Julius II. and Louis XII. of France, who were at that time at variance; and he happily ſucceeded in conciliating the difference. Having taken leave of the Pope, he paſſed through France on his return home, where he was kindly received by the king and queen, who beſtowed upon him the biſhopric of Bourges in France, which annually brought him in 400 tons of wine, 10,000 francs of gold, and other ſmaller articles. Beſides all this, he was moſt liberally rewarded by Pope Julius, who promoted him to the archbiſhopric of St Andrew's, as has been already mentioned; conferred on him the two rich abbeys of Dunfermline and Aberbrothic; and made him his legate à latere. At that time, however, there were two other candidates for the archiepiſcopal ſee. The learned Gavin Douglas, biſhop of Dunkeld, having been nominated by the queen, had actually taken poſſeſſion of it; but John Hepburn, a bold and factious man, having been preferred by the monks, drove out the officers of Gavin Douglas, and placed a ſtrong garriſon in the caſtle. So great was the power of this man, that when Forman was nominated by the Pope, no perſon could be found who durſt proclaim the bulls for his election. At laſt Lord Home, at that time the moſt powerful nobleman in Scotland, was induced, by large promiſes, beſides ſome gifts of great conſequence, among which was the donation of the abbacy of Coldingham to his youngeſt brother David, to undertake the taſk. It was executed at Edinburgh and St Andrew's; to which places Lord Home's brother went with 10,000 men; though the doing of it, contrary to Forman's inclination, proved a ſource of much trouble to that nobleman afterwards. The quarrel betwixt Hepburn and Forman, however, was at laſt terminated by the latter ſurrendering the biſhopric of Moray, as well as ſome years revenue of the archbiſhopric itſelf; paying Hepburn alſo 3000 French crowns annually out of his eccleſiaſtical revenues. On the appointment of the duke of Albany to the regency, Hepburn endeavoured to undermine the primate's credit with that nobleman, by repreſenting him as one who had in a manner collected all the money in the country, and who conſequently might endanger the tranquillity of the kingdom. Theſe inſinuations, however, were but little regarded by the regent; and Forman had the good fortune afterwards to make up a difference between him and the nobility, which was likely to be attended with much bloodſhed. In 1517, the archbiſhop was appointed by the ſtates one of the lords of the regency, on occaſion of the duke of Albany's going to France. We have already mentioned his embaſſy to Pope Julius II. In M'Kenzie's Lives we are informed, that in the collection of the Letters of the Scottiſh Kings from the year 1505 till the year 1626, in the lawyers library, there is a letter from that pope to King James IV. wherein he not only highly commends Forman, but likewiſe promiſes that at the firſt creation of cardinals he ſhould be made one. This letter is dated the 6th of May 1511: but the pope died before he had an opportunity of performing his promiſe. In the ſame collection there is a letter from the duke of Albany to Leo X. Julius's ſucceſſor, wherein he preſſes the pope to advance him to the dignity of a cardinal promiſed him by his predeceſſor, and to continue him his legate à latere. Archbiſhop Forman died in 1521, and was buried at Dunfermline. Dempſter ſays that he wrote a book againſt Luther, a book concerning the Stoic Philoſophy, and a Collection out of the Decretals.

Forman || Forming.

FORMATION, in *Philoſophy*, an act whereby ſomething is formed or produced. For the formation of the fœtus in the womb, ſee ANATOMY, N° 109, 110.

FORMATION of Stones. See STONE.

FORMATION of Metals and Minerals. See METAL and MINERAL.

FORMATION, in *Grammar*, ſignifies the manner of forming one word from another; thus *accountantſhip* is formed from *accountant*, and this laſt from *account*.

FORMEDON, in *Law*, (breve *de forma donationis*), a writ that lies for a perſon who has a right to lands or tenements, by virtue of any entail, ariſing from the ſtatute of Weſtm. 2. Ch. II.

This writ is of three kinds, viz. a deſcender, remainder, and reverter. Formedon in *deſcender*, lies where a tenant in tail infeoffs a ſtranger, or is diſſeiſed and dies, and the heir may bring this writ to recover the lands. Formedon in *remainder*, lies where a man gives lands, &c. to a perſon in tail, and for the default of iſſue of his body, the remainder to another in tail: here if the tenant in tail die without iſſue, and a ſtranger abates and enters into the land, he in remainder ſhall have this writ. Formedon in *reverter*, lies where lands are entailed on certain perſons and their iſſue, with remainder over for want of iſſue; and, on that remainder failing, then to revert to the donor and his heirs: in this caſe, if the tenant in tail dies without iſſue, and alſo he in remainder, the donor and his heirs, to whom the reverſion returns, may have this writ for the recovery of the eſtate, though the ſame be alienated, &c.

FORMIÆ, or FORMIA, in *Ancient Geography*, a maritime town of the Adjected or New Latium, to the ſouth-eaſt of Caieta; built by the Lacedæmonians, (Strabo); called originally *Hormiæ*, on account of its commodious harbour. An ancient municipium. *Formiani*, the people; who were admitted to the liberty of the city the very year in which Alexandria was built; but not to the right of ſuffrage till a long time after the ſecond Punic war, (Livy). *Formiæ* at this day lies in ruins, near a place now called *Mola*.

FORMICA, the ANT, a genus of inſects belonging to the order of hymenoptera. See ENTOMOLOGY *Index*.

The inſects called *white ants*, which abound in Africa and the Eaſt Indies, belong to the genus termes, which ſee in ENTOMOLOGY *Index*.

FORMICA Leo, the *Ant lion*, ſo called from its devouring great numbers of ants. It is the caterpillar or worm of a fly much reſembling the libellæ or dragon flies; and feeds chiefly upon ants.

FORMING is uſed for the act of giving being or birth to any thing.

The word is alſo ſimply uſed for giving the figure to any thing. The potter forms his veſſels as he pleaſes. Geometry teaches how to form all kinds of figures.

It is likewiſe uſed for the producing of a thing: thus, the lineaments of the face began to be formed.

Forming, Formoſa.

FORMING of a Siege, is the making lines of circumvallation to fortify the camp, and diſpoſing things for the attack of a place in form.

They alſo ſay, to form a ſquadron or battalion; meaning to range the ſoldiers in form of a ſquadron, &c.

FORMING the Line, is drawing up infantry, cavalry, and artillery, into line of battle. See LINE.

FORMING is alſo uſed in grammar, in ſpeaking of certain tenſes of verbs, which are made from others by a change of certain letters. The preſent tenſe is formed from the infinitive. Compound and derivative words alſo, and even all that have any cytomology, are ſaid to be formed.

FORMOSA, an iſland in the Pacific ocean, between 119° and 122° of E. Long, and 22° and 25° N. Lat. about 100 miles eaſt of Canton in China. It is ſubject to the Chineſe; who, however, notwithſtanding its vicinity, did not know of its exiſtence until the year 1430. It is about 85 leagues in length, and 25 in breadth. A long chain of mountains, which runs from north to ſouth, divides it into two parts, the eaſtern and weſtern. The Dutch formed an eſtabliſhment in the weſtern part in 1634, and built the fort of Zealand, which ſecured to them the principal port of the iſland; but they were driven from thence in 1659 or 1661 by a celebrated Chineſe pirate, who made himſelf maſter of all the weſtern part, which afterwards ſubmitted in 1682 to the authority of Kang-he emperor of China.

This weſtern part of Formoſa is divided into three diſtinct governments, all ſubordinate to the governor of TAI-OUAN, the capital of the iſland, who is himſelf ſubject to the viceroy of the province of FOKIEN.

This iſland preſents extenſive and fertile plains, watered by a great number of rivulets that fall from the eaſtern mountains. Its air is pure and wholeſome; and the earth produces in abundance, corn, rice, and the greater part of other grains. Moſt of the Indian fruits are found here, ſuch as oranges, bananas, pine-apples, guavas, papaws, cocoa nuts; and part of thoſe of Europe, particularly peaches, apricots, figs, raiſins, cheſnuts, pomegranates, water melons, &c. Tobacco, ſugar, pepper, camphire, and cinnamon, are alſo common. Horſes, ſheep, and goats, are very rare in this iſland: there are even few hogs, although theſe animals abound in China. Domeſtic poultry, ſuch as fowls, geeſe, and ducks, are exceedingly plenty; pheaſants alſo are ſometimes ſeen; and monkeys and ſtags have multiplied ſo much, that they wander through the country in large flocks.

The inhabitants of Formoſa rear a great number of oxen, which they uſe for riding, from a want of horſes and mules. They accuſtom them early to this kind of ſervice, and by daily exerciſe train them to go as well and as expeditiouſly as the beſt horſes. Theſe oxen were furniſhed with a bridle, ſaddle, and crupper. A Chineſe looks as big and proud when mounted in this manner, as if he were carried by the fineſt Barbary courſer.

Wholeſome water fit for drinking is the only thing wanting in the iſland of Formoſa. It is very extraordinary, that every kind of water in it is a deadly poiſon to ſtrangers, for which no remedy has hitherto been found. "One of the governor's ſervants," ſays Father de Mailla, "whom I had in my train (a ſtrong and robuſt man), truſting too much to the force of his conſtitution, would not believe what had been told him concerning this water: he drank ſome of it; and died in leſs than five days, after every medicine and antidote had been adminiſtered without ſucceſs. There is none but the water of the capital which can be drunk: the mandarins of the place therefore always took care to tranſport a ſufficiency of it in carts for our uſe." Our author adds, that at the bottom of a mountain a league diſtant from Fong-kan-hien there is a ſpring that produces a ſtream, the water of which is of a whitiſh blue colour, and ſo noxious, that no one can approach it. Formoſa.

There are few mulberry trees in Formoſa, conſequently little ſilk is made in the country. Numerous manufactures, however, would ſoon be introduced into it, were the Chineſe permitted indiſcriminately to tranſport themſelves thither, and to form eſtabliſhments in the iſland. Thoſe who go to it muſt be protected by paſſports from the Chineſe mandarins, and theſe paſſports are ſold at a dear rate; ſecurities are beſides required. This is not all: when they arrive, money muſt be given to the mandarins who are appointed to examine thoſe who enter or quit the iſland, and who generally diſcharge this duty with the moſt rigid ſeverity. If they give no preſent, or offer only a trifle, they meet with little mercy; and are ſure to be ſent back, whatever paſſport they may have. The Chineſe, through policy, connive at theſe exactions, to prevent too great a number of people from emigrating to this iſland, which is rendered a place of great importance by its proximity to China. They fear, and with great reaſon (eſpecially ſince Tartar emperors have been on the throne), that if any revolt ſhould happen in Formoſa, its influence might ſpread and occaſion great diſturbance in the whole empire. On this account, the Tartars keep a garriſon there of 10,000 men: which they take care to change every three years, or even oftener if they judge it neceſſary.

Beſides the capital, the Chineſe have alſo two other cities, and ſome villages, where they inhabit alone; for they do not permit the Indians, who are their ſubjects, to live among them; they ſuffer none to remain but thoſe who are either their ſlaves or domeſties.—Theſe Indians are united into 45 villages; 36 of which lie to the north, and 9 towards the ſouth. The northern villages are very populous, and the houſes are built almoſt after the Chineſe manner. The habitations of the ſouthern iſlanders are only heaps of huts or cottages of earth. In theſe huts they have neither chairs, benches, tables, beds, nor any piece of furniture; the middle part is occupied by a kind of hearth or chimney, raiſed two feet high, and conſtructed of earth, upon which they dreſs their victuals. Their ordinary food is rice, other ſmall grain, and the game which they catch by courſing or kill with their arms. Theſe iſlanders run with ſuch ſurpriſing ſwiftneſs, that they can almoſt outſtrip the fleeteſt greyhound. The Chineſe attribute this agility to the precaution they take of confining their knees and reins by a cloſe bandage until the age of 14 or 15. Their favourite arms are lances, which they dart to the diſtance of 60 or 80 feet with the greateſt dexterity and preciſion. They uſe bows and arrows, and can kill a pheaſant on wing with

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Formoſa. as much certainty as an European ſportſman could with a fuſee. Theſe people are very dirty in their manner of eating. They have neither plates, diſhes, nor ſpoons, nor even the ſmall ſticks uſed in China. Whatever they dreſs is placed on a plain board or mat, and they make uſe of their fingers for conveying it to their mouths. They eat fleſh half raw; and provided it has been only preſented to the fire, it appears to them excellent. Their beds are formed of freſh gathered leaves. They go almoſt naked, and wear only a piece of cloth which hangs from their girdle to their knees. Thoſe among them, who, according to the judgment of the chiefs of the village, have borne away the prize for agility in running, or dexterity in the chaſe, obtain the honourable privilege of making on their ſkin, by a very painful operation, ſeveral fantaſtical figures of flowers, trees, and animals. All have the right of blackening their teeth, and of wearing ornaments of bracelets and crowns made of ſhells and cryſtal.

The iſlanders who inhabit the northern part, where the climate is ſomething colder, clothe themſelves with the ſkins of the ſtags which they kill in hunting. They make a kind of dreſs of them without ſleeves, that pretty much reſembles a dalmatic, or veſtment worn at the altar by the Roman clergy. They wear on their heads caps in the form of a cylinder, made of palm leaves, and ornamented with ſeveral crowns placed one above another, on the top of which they fix plumes compoſed of the feathers of a cock or pheaſant.

The marriage ceremonies of the inhabitants of Formoſa approach near to the ſimple laws of nature. They neither purchaſe, as in China, the women whom they eſpouſe, nor does intereſt ever preſide over their unions. Fathers and mothers are ſcarcely ever conſulted. If a young man has a mind to marry, and has fixed his affection on a young girl, he appears for ſeveral days following near the place where ſhe lives with a muſical inſtrument in his hand. If the young woman is ſatisfied with the figure of her gallant, ſhe comes forth and joins him: they then agree and ſettle the marriage contract. After this they give notice to their parents, who prepare a wedding dinner, which is always given in the houſe where the young woman reſides, and where the bridegroom remains without returning again to his father. The young man afterwards conſiders the houſe of his father-in-law as his own. He becomes the whole ſupport of it, and he has no farther connection with that of his father; like married women in Europe, who generally quit their paternal home in order to live with their huſbands. Theſe iſlanders therefore ſeldom offer up vows for obtaining male children: they prefer daughters, becauſe they procure them ſons-in-law, who become the ſupports of their old age.

Although the Formoſans are entirely ſubjected to the Chineſe, they ſtill preſerve ſome remains of their ancient government. Each village chooſes three or four old men from among thoſe who have the greateſt reputation for probity. By this choice they become the rulers and judges of the reſt of the hamlet. They have the power of finally determining all differences; and if any one ſhould refuſe to abide by their judgment, he would be immediately baniſhed from the village, without hopes of ever being able to re-enter it, and none of the inhabitants would afterwards dare to receive him. Formoſa.

The natives pay in grain the tribute impoſed on them by the Chineſe. To regulate every thing that concerns the laying on and collecting of this impoſt, government has eſtabliſhed a Chineſe in every village, who is obliged to learn the language and act as interpreter to the mandarins. Theſe interpreters are moſt cruel extortioners to the miſerable people, whom they ought rather to protect: they are ſuch inſatiable leeches that they can ſcarcely ever be ſatisfied. This daily and domeſtic tyranny has already cauſed the defection of three villages in the ſouthern part of the iſland, where formerly there were twelve. The inhabitants of theſe villages revolted, expelled their interpreters, refuſed to pay tribute any longer to the Chineſe, and have united themſelves to the independent nation in the eaſtern part of the iſland.

It was in the iſland of Formoſa that John Struys affirms to have ſeen with his own eyes a man who had a tail more than a foot in length, covered with red hair, and greatly reſembling that of an ox. This man with a tail ſaid, that his deformity, if it was one, proceeded from the climate, and that all thoſe of the ſouthern part of the iſland were born with tails like his.—But John Struys is the only author who atteſts the exiſtence of this extraordinary race of men; no other writer who has ſpoken of Formoſa makes the leaſt mention of them. Another circumſtance, no leſs ſingular, and which appears to be little better authenticated, is, that in this iſland women are not permitted to bring forth children before they are 35, although they are at liberty to marry long before that age. Rechteren * thus expreſſes himſelf concerning this ſtrange cuſtom.

" When women are firſt married, they bring no children into the world: they muſt, before that is permitted, have attained the age of 35 or 37. When they are big with child, their prieſteſſes pay them a viſit, and tread on their bellies with their feet, if it be neceſſary, and make them miſcarry, with perhaps greater pains than they would have in being brought to bed. It would be not only a ſhame, but an enormous crime, to bring forth a child before the time preſcribed. I have ſeen ſome females who had already deſtroyed the fruit of their womb 15 or 16 times, and who were big for the 17th when it was lawful for them to bring forth a living child."

* *Dutch East India Company Voyages*, vol. v. p. 96.

To our deſcription of Formoſa we ſhall add the following account of a dreadful diſaſter that befel this unhappy iſland. The details were conveyed by a letter from Peking, addreſſed to M. Bertin, and dated the 14th of July 1782.

" The waters of the ocean have well nigh deprived China of one of its moſt valuable maritime poſſeſſions. The iſland of Tay-ouan, known in Europe by the name of Formoſa, has been almoſt ſwallowed up by them. It has been reported here, that part of the mountain which divides the iſland has ſunk and diſappeared; that the reſt has been overturned; and that the greater part of the inhabitants have periſhed. Such have been for ſome days the popular reports in this capital. Government, however, has put a ſtop to them, by informing the public of the real truth; ſuch as it is has

Formoſa. has been announced to the emperor by the officers who have this ſmall portion of his territories under their juriſdiction. I cannot do better than tranſcribe what they have written. The diſpatches of the Chineſe officers, addreſſed to the emperor, run thus:

"Bechen, governor-general of the provinces of Fokien and Tche-Kyang-ya, viceroy of Fokien, and others, make known to your majeſty the diſaſter that has lately befallen the iſland of Tay-ouan. Mon-ha-hon, and other principal officers of this iſland, have acquainted us, that on the 21ſt of the fourth moon (May 22. 1782), a moſt furious wind, accompanied with heavy rain and a ſwell of the ſea greater than ever remembered, had kept them under continual apprehenſion of being ſwallowed up by the waves, or buried in the bowels of the earth, from the hour of *yn* until the hour *ouei* (A). This dreadful tempeſt ſeemed to blow at the ſame time from the four cardinal points of the compaſs, and continued with equal violence during the above-mentioned time. The buildings where the tribunals were held, the public granaries, the barracks, ſalt warehouſes, and works, have been totally deſtroyed, and every thing they contained is loſt: warehouſes and work ſhops, as well as private houſes, for the moſt part, preſent nothing but ruins and heaps of rubbiſh. Of 27 ſhips of war which were in the harbour, 12 have diſappeared; two others have been daſhed to pieces, and 10 are ſhattered in ſuch a manner that they are rendered entirely unfit for ſervice; other ſmaller veſſels of different ſizes, above 100 in number, have ſhared the ſame fate; eighty have been ſwallowed up; five others, which had juſt taken in a lading of rice for Fokien, have ſunk, and their cargoes, which amounted to 100,000 buſhels, are wholly loſt. With regard to other veſſels, whether ſmall or great, which had not entered the harbour, 10 or 12 of the largeſt are reckoned to have been ſwallowed up; thoſe of inferior ſize, as well as a prodigious number of barks, boats, and other ſmall veſſels of different kinds, have diſappeared, without leaving the leaſt piece of wreck behind them. As the whole iſland has been covered with water, the proviſions have been either ſwept away, or ſpoilt ſo as to render them prejudicial to the health of thoſe who uſe them in their preſent ſtate. The crops are entirely loſt. When we ſhall have been informed of particulars, we ſhall not fail to give your majeſty the earlieſt intelligence of them.—After having received this letter from Mon-ha-hon, and the other principal officers reſiding at Tay-ouan, I employed the utmoſt diligence to give every aſſiſtance in my power to this unfortunate iſland; and I ordered the travelling commiſſary, and Trey-ouer, general of the province, to get particular information of the number of thoſe who have periſhed, of the houſes deſtroyed, and of the quantity of ſalt and other proviſions that has been loſt: I have likewiſe enjoined them to rebuild with the utmoſt expedition the tribunals, granaries, and other public edifices; to diſpatch proper perſons to ſearch for the veſſels and ſhips that have diſappeared; to repair thoſe which are not altogether unfit for ſervice, and to ſend immediately to the neighbouring countries for ſalt and other neceſſary proviſions: but above all, to aſcertain in the moſt accurate manner the different loſſes ſuſtained by the inhabitants, and the preciſe number of people that have periſhed, in order that I may be able to give the fulleſt information to your majeſty."

Formoſa, Formula.

'The emperor of China cauſed a particular detail of theſe loſſes to be publiſhed, together with the following letter:

"Tchang-yu, &c. Tchem-hoeï-Thon-Tſong-tou of Fokien, and others, have informed me of the diſmal event that hath taken place in the iſland of Tay-ouan, which is a diſtrict of the province of Fokien. They have written to me, that on the 21ſt of the fourth moon—[Here the emperor repeats what is contained in the preceding letter, and continues thus]. I command Tſong-tou to get the beſt information he can of the different loſſes ſuſtained by the inhabitants of the iſland, and to tranſmit the particulars to me, in order that I may give them every aſſiſtance to repair them. My intention is, that all the houſes which have been thrown down ſhall be rebuilt entirely at my expence; that thoſe be repaired which are only damaged; and that proviſions, and every thing which the people ſtand in immediate want of, be ſupplied them. I ſhould feel much pain, were even one among them to be neglected: I therefore recommend the utmoſt diligence and ſtricteſt inquiry, as I am deſirous that none of my ſubjects ſhould entertain the leaſt doubt of the tender affection which I have for them; and that they ſhould know that they are all under my eyes, and that I myſelf will provide for their wants. With regard to my ſhips of war, tribunals, and public edifices, let them be reſtored to their former ſtate with money taken from the public treaſury, and let the general account of the whole expence be laid before me."

The miſſionary who ſent this account farther ſays, From theſe letters it evidently appears, that this diſaſter happened in conſequence of an earthquake; but he adds, that the volcano which occaſioned it muſt be at a prodigious depth below the ſea. He does not pretend to give an explanation of it; he is contented with obſerving, that the ſame ſcene ſeems to have paſſed on the iſland of Formoſa as at Lima and Liſbon.

FORMULA, or FORMULARY, a rule or model, or certain terms preſcribed or decreed by authority, for the form and manner of an act, inſtrument, proceeding, or the like.

FORMULA, in *Church-Hiſtory* and *Theology*, ſignifies a profeſſion of faith.

FORMULA, in *Medicine*, imports the conſtitution of medicines, either ſimple or compound, both with reſpect to their preſcription and conſiſtence.

FORMULA, a theorem or general rule, or expreſſion, for ſolving certain particular caſes of ſome problem, &c.

ſo $\frac{1}{2}s+\frac{1}{2}d$ is a general formula for the greater of

two

(A) The hours of the Chineſe are double ours: the hour *yn* begins at three in the morning and ends at five; *ouei* begins at three in the afternoon and ends at five.

Formula || Fornication.

two quantities whose sum is s, and difference d; and $\frac{1}{2}s - \frac{1}{2}d$ is the formula, or general value, for the less quantity. Also $\sqrt{dx - x^2}$, is the formula, or general value, of the ordinate to a circle, whose diameter is d, and abscis x.

FORMULARY, a writing, containing the form or formula of an oath, declaration, attestation, or abjuration, &c. to be made on certain occasions.

There are also formularies of devotion, of prayers, &c. Liturgics are formularies of the public service in most churches.

FORNACALIA, or FORNICALIA, in Roman antiquity, a festival instituted by Numa, in honour of Fornax, the goddess of ovens; wherein certain cakes were made, and offered in sacrifice before the ovens.

FORNICATION (*Fornicatio*, from the *fornices* in Rome, where the lewd women prostituted themselves for money), is whoredom, or the act of incontinency, between single persons; for if either of the parties is married, it is *adultery*. Formerly court leets had power to inquire of and punish fornication and adultery; in which courts the king had a fine assessed on the offenders, as appears by the book of Domesday.

In the year 1650, when the ruling powers found it for their interest to put on the semblance of a very extraordinary strictness and purity of morals, not only incest and wilful adultery were made capital crimes, but also the repeated act of keeping a brothel, or committing fornication, was, upon a second conviction, made felony without benefit of clergy. But, at the Restoration, when men, from an abhorrence of the hypocrisy of the late times, fell into a contrary extreme of licentiousness, it was not thought proper to renew a law of such unfashionable rigour. And these offences have been ever since left to the feeble coercion of the spiritual court, according to the rules of the canon law; a law which has treated the offence of incontinence, nay, even adultery itself, with a great degree of tenderness and lenity; owing perhaps to the constrained celibacy of its first compilers. The temporal courts therefore take no cognizance even of the crime of adultery otherwise than as a private injury. See ADULTERY.

The evils of fornication, which too many wish to consider as no sin, may be judged of from the following particulars.

1. The malignity and moral quality of each crime is not to be estimated by the particular effect of one offence, or of one person's offending, but by the general tendency and consequence of crimes of the same nature. In the present case, let the libertine consider and say, what would be the consequence, if the same licentiousness in which he indulges were universal? or what should hinder its becoming universal, if it be innocent or allowable in him?

2. Fornication supposes prostitution; and by prostitution the victims of it are brought to almost certain misery. It is no small quantity of misery in the aggregate, which, between want, disease, and insult, is suffered by those outcasts of human society who infest populous cities; the whole of which is a general consequence of fornication, and to the increase and continuance of which every act and instance of fornication contributes. Fornication.

3. Fornication produces habits of ungovernable lewdness, which introduce the more aggravated crimes of seduction, adultery, violation, &c. The criminal indulgences between the sexes prepare an easy admission for every sin that seeks it: they are, in low life, usually the first stage in men's progress to the most desperate villanies; and in high life, to that lamented dissoluteness of principle, which manifests itself in a profligacy of public conduct, and a contempt of the obligations of religion and moral probity.

4. Fornication perpetuates a disease, which may be accounted one of the worst maladies of human nature, and the effects of which are said to visit the constitution of even distant generations.

The passion being natural, proves that it was intended to be gratified; but under what restrictions, or whether without any, must be collected from different considerations.

In the Scriptures, fornication is absolutely and peremptorily condemned. 'Out of the heart proceed evil thoughts, murders, adulteries, fornication, thefts, false witness, blasphemies; these are the things which defile a man.' These are Christ's own words; and one word from him upon the subject is final. The apostles are more full upon this topic. One well-known passage in the Epistle to the Hebrews may stand in the place of all others; because, admitting the authority by which the apostles of Christ spake and wrote, it is decisive. 'Marriage and the bed undefiled is honourable amongst all men, but whoremongers and adulterers God will judge;' which was a great deal to say, at a time when it was not agreed even amongst philosophers that fornication was a crime.

Upon this subject Mr Paley adds the following observations*.

* *Moral and Political Philosophy*, p. 246.

"The Scriptures give no sanction to those austerities which have been since imposed upon the world under the name of Christ's religion, as the celibacy of the clergy, the praise of perpetual virginity, the *prohibitio concubitus cum gravida uxore*; but with a just knowledge of, and regard to the condition and interest of the human species, have provided in the marriage of one man with one woman an adequate gratification for the propensities of their nature, and have restrained them to that gratification.

"The avowed toleration, and in some countries the licensing, taxing, and regulating of public brothels, has appeared to the people an authorizing of fornication, and has contributed, with other causes, so far to vitiate the public opinion, that there is no practice of which the immorality is so little thought of or acknowledged, although there are few in which it can more plainly be made out. The legislators who have patronized receptacles of prostitution ought to have foreseen this effect, as well as considered, that whatever facilitates fornication, diminishes marriages. And as to the usual apology for this relaxed discipline, the danger of greater enormities if access to prostitutes were too strictly watched and prohibited; it will be time enough to look to that, after the laws and the magistrates have done their utmost. The greatest vigilance of both will do no more, than oppose some bounds and some difficulties to this intercourse. And after all, these pretended

Fornication ‖ Forres.

fears are without foundation in experience. The men are in all reſpects the moſt virtuous in countries where the women are moſt chaſte.

"If fornication be criminal, all thoſe incentives which lead to it are aceeſſaries to the crime: as laſcivious converſation, whether expreſſed in obſcene or diſguiſed under modeſt phraſes; alſo wanton ſongs, pictures, books; the writing, publiſhing, and circulating of which, whether out of frolic or for ſome pitiful profit, is productive of ſo extenſive a miſchief from ſo mean a temptation, that few crimes within the reach of private wickedneſs have more to anſwer for, or leſs to plead in their excuſe.

"Indecent converſation, and by parity of reaſon all the reſt, are forbidden by St Paul, Eph. iv. 29. 'Let no corrupt communication proceed out of your mouth;' and again, Col. iii. 8. 'Put filthy communication out of your mouth.'

"The invitation or voluntary admiſſion of impure thoughts, or the ſuffering them to get poſſeſſion of the imagination, falls within the ſame deſcription, and is condemned by Chriſt, Matt. v. 28. 'Whoſoever looketh on a woman to luſt after her, hath committed adultery with her already in his heart.' Chriſt, by thus enjoining a regulation of the thought, ſtrikes at the root of the evil."

FORNIX, in *Anatomy*, is part of the corpus callo-ſum in the brain; ſo called, on account of a diſtant reſemblance to the arches of ancient vaults when viewed in a particular manner.

FORRAGE, in the military art, denotes hay, oats, barley, wheat, graſs, clover, &c. brought into the camp by the troopers, for the ſuſtenance of their horſes.

It is the buſineſs of the quartermaſter general to appoint the method of forrage, and poſt proper guards for the ſecurity of the forragers.

FORRES, a borough town of Scotland in the county of Murray, claiming with Invernefs, Fortroſe, and Nairn. It is a ſmall well built town, pleaſantly ſituated on an eminence near the river Findhorn. The country about it has a cheerful appearance, having a few gentlemen's ſeats, with ſome plantations about them. On a hill weſt of the town are the remains of a caſtle; and a melancholy view of a number of ſand-hills, that now cover that tract of land which was formerly the eſtate of a Mr Cowben in the pariſh of Dyke. This inundation was occaſioned by the influx of the ſea and the violence of the wind. It had been the cuſtom to pull up the bent, a long ſpiry graſs near the ſhore, for litter for horſes, by which means the ſand was looſened, and gave way to the violence of the ſea and wind, which carried it over ſeveral thouſand acres of land. The people having been prevented from pulling up any more of the graſs, the progreſs of the ſand is now nearly ſtopped, and the ſea has retired; but the wind has blown ſome of the ſand from the hills over Colonel Grant's land, and deſtroyed near 100 acres. A ſand bank, which is all dry at low water, runs out from this place for ſeveral miles into the Murray Frith. Some of the land, which has been long forſaken by the water, is now beginning to be uſeful again, and is turned into grazing land. At Forres, coarſe linen and ſewing thread are made. Eaſt from the town, and on the left hand ſide of the road, is a remarkable obeliſk, which is ſaid to be the moſt ſtately monument of the kind to be ſeen in Europe. It has been the ſubject of many able pens; but totally overlooked by Dr Johnſon, who ſays, "At Forres we found good accommodation, but nothing worthy of particular remark."—It is thus deſcribed by Mr Cordiner, in a letter to Mr Pennant: "In the firſt diviſion, underneath the Gothic ornaments at the top, are nine horſes with their riders marching forth in order: in the next is a line of warriors on foot, brandiſhing their weapons, and appear to be ſhouting for the battle. The import of the attitudes in the third diviſion is very dubious, their expreſſion indefinite. The figures which form a ſquare in the middle of the column are pretty complex but diſtinct; four ſerjeants with their halberts guard a canopy, under which are placed ſeveral human heads which have belonged to the dead bodies piled up at the left of the diviſion; one appears in the character of executioner ſevering the head from another body; behind him are three trumpeters ſounding their trumpets, and before him two pair of combatants fighting with ſword and target. A troop of horſe next appears, put to flight by infantry, whoſe firſt line have bows and arrows; the three following, ſwords and targets. In the lowermoſt diviſion now viſible, the horſes ſeem to be ſeized by the victorious party, their riders beheaded, and the head of their chief hung in chains or placed in a frame; the others being thrown together beſide the dead bodies under an arched cover. The greateſt part of the other ſide of the obeliſk, occupied by a ſumptuous croſs, is covered over with an uniform figure, elaborately raiſed, and interwoven with great mathematical exactneſs. Under the croſs are two auguſt perſonages, with ſome attendants, much obliterated, but evidently in an attitude of reconciliation; and if the monument was erected in memory of the peace concluded between Malcolm and Canute, upon the final retreat of the Danes, theſe large figures may repreſent the reconciled monarchs. On the edge below the fretwork are ſome rows of figures joined hand in hand, which may alſo imply the new degree of confidence and ſecurity which took place, after the feuds were compoſed, which are characterized on the front of the pillar. But to whatever particular tranſaction it may allude, it can hardly be imagined, that in ſo early an age of the arts in Scotland as it muſt have been raiſed, ſo elaborate a performance would have been undertaken but in conſequence of an event of the moſt general importance; it is therefore ſurpriſing, that no diſtincter traditions of it arrived at the era when letters were known. The height of this monument (called *King Sueno's ſtone*) above the ground is 23 feet; beſides 12 or 15 feet under ground. Its breadth is 3 feet 10 inches by 1 foot 3 inches in thickneſs."

Forres ‖ Fort.

FORSKOHLEA, a genus of plants belonging to the decandria claſs. See BOTANY *Index*.

FORSTERA, a genus of plants belonging to the gynandria claſs. See BOTANY *Index*.

FORT, in the military art, a ſmall fortified place, environed on all ſides with a moat, rampart, and parapet. Its uſe is to ſecure ſome high ground, or the paſſage of a river, to make good an advantageous poſt, to defend the lines and quarters of a ſiege, &c.

Forts are made of different figures and extents, according

Fort || Vitrified Forts.

cording as the ground requires. Some are fortified with baſtions, others with demibaſtions. Some again are in form of a ſquare, others of a pentagon. A fort differs from a citadel, as this laſt is built to command ſome town.

Royal FORT, is one whoſe line of defence is at leaſt 26 fathoms long.

Star FORT, is a ſconce or redoubt, conſtituted by re-entering and ſalient angles, having commonly from five to eight points, and the ſides flanking each other.

Vitrified FORTS, a very ſingular kind of ſtructures found in the highlands and northern parts of Scotland, in which the walls have the appearance of being melted into a ſolid maſs, ſo as to reſemble the lava of a volcano, for which indeed they have been taken by ſeveral perſons who have viſited them.

Theſe walls were taken notice of by Mr Williams an engineer, who wrote a treatiſe upon the ſubject, and was the firſt who ſuppoſed them to be works of art; other naturaliſts having attributed them to a volcanic origin. Theſe works are commonly ſituated on the tops of ſmall hills, commanding an extenſive view of the adjacent valley or low country. The area on the ſummit, varying, as is ſuppoſed, according to the number of cattle the proprietor had to protect, or the dependents he was obliged to accommodate, is ſurrounded with a high and ſtrong wall, of which the ſtones are melted, moſt of them entirely; while others, in which the fuſion has not been ſo complete, are ſunk in the vitrified matter in ſuch a manner as to be quite encloſed with it; and in ſome places the fuſion has been ſo perfect, that the ruins appear like maſſes of coarſe glaſs. Mr Williams has not only abſolutely determined the walls in queſtion to be the works of art, but has even hazarded a conjecture as to the manner in which they were conſtructed, and which, according to him, was as follows. Two parallel dikes of earth or ſod being raiſed, in the direction of the intended wall, with a ſpace between them ſufficient for its thickneſs, the fuel was put in, and ſet on fire. The ſtones beſt adapted for the purpoſe, called the *plum-pudding ſtone*, are everywhere to be found in the neighbourhood. Theſe were laid on the fuel, and when melted, were kept by the frame of earth from running off; and by repeating the operation, the wall was raiſed to a ſufficient height. This opinion of the ſtones being thrown in without any order, is thought to be confirmed by the circumſtance of there not being anywhere a large one to be ſeen, nor a ſtone laid in any particular direction, nor one piece which has not in ſome degree been affected by the fire. Mr Williams mentions a fact tending to confirm his hypotheſis, viz. of a brick kiln ſituated on the declivity of an eminence, ſo as to be expoſed to the wind, which happening to riſe briſkly one time when the kiln was burning, ſo increaſed the heat, that the bricks were melted, and ran, like a lava, for a conſiderable way down the hill.

The opinion of Mr Williams has been embraced by ſeveral other authors; particularly Mr Freebairn and Dr Anderſon, the latter having publiſhed two treatiſes upon theſe buildings in the Archæologia. In the ſame work, however, we meet with a paper by the Hon. Daines Barrington, in which the author expreſſes quite different ſentiments. He obſerves, that Mr Williams, and the other antiquaries, who ſuppoſe the walls in queſtion to be works of art, imagine that the reaſon of their being conſtructed in this manner was the ignorance of cement, which in theſe remote ages prevailed in Scotland: but with reſpect to this circumſtance, he ſays, that if one ſide of the wall only was heated, and that to any conſiderable height, the matter in fuſion would in all likelihood drop down to the bottom, without operating as any cement to the looſe ſtones thrown in amongſt it. This circumſtance of the walls being vitrified only on one ſide, is indeed remarkable, and takes place in moſt of the forts of this kind to be met with at preſent: but with regard to it, Mr Barrington obſerves, that he himſelf has been twice in the Highlands of Scotland, and has found very few hills of any height which were clothed with wood; the trouble therefore of carrying it up to the top of ſuch a mountain would be very conſiderable. But to this it might eaſily be replied, that we cannot by any means argue from the preſent ſtate of the hills in the Highlands to their ſtate in a very remote period of antiquity. At that time, it is neither impoſſible, nor in the leaſt improbable, that moſt of the hills in Scotland were overgrown with wood; or at any rate, there undoubtedly was plenty of peat, which is ſtill uſed as fuel in Scotland, and which affords ſuch a ſtrong heat as to be advantageouſly employed in ſmelting iron, as we are informed by M. Magellan. A third particular mentioned by Mr Williams is, that theſe encloſures were intended as places of defence; and in ſupport of this opinion he alleges, that there are dried wells found within moſt of them. But on this Mr Barrington obſerves, that ſhelter from the weather was alſo neceſſary, "upon the top of a bleak Scotch hill, whilſt whiſky (or a ſuccedaneum for it) would be often in greater requeſt than the bare element of water." This objection, however, as well as the laſt, is evidently very frivolous; for theſe buildings might have roofs as well as any other; and whatever neceſſity there might be for whiſky occaſionally, water was certainly an indiſpenſable requiſite.

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Mr Barrington having thus given his reaſons for diſſenting from the opinion of Mr Williams and the antiquaries juſt mentioned, proceeds to ſtate his own. He tells us, that having travelled for 21 years the moſt mountainous circuit in Wales, he has frequently obſerved encloſures of dry ſtones, particularly a long tract in the weſtern part of Merionethſhire, called in the language of the country *Duffryn*, i. e. the *vale*. On firſt viewing theſe ſmall encloſures made with walls of thick ſtones, he was at a loſs to imagine how it could be worth while to conſtruct ſuch ſtrong fences for ſo inconſiderable a piece of ground as they encloſed; but, on examining the adjacent country, he found it almoſt entirely covered with ſtones of a ſimilar kind; and, of conſequence, the ſmaller the ſpace to be cleared, the leſs expenſive would be the removal. "For the ſame reaſon (ſays he), ſuch dry walls are often of a great thickneſs, and ſometimes the corners of the encloſures are filled with ſtones to a great width, this being the only poſſible means of procuring paſture." To a practice of the ſame kind our author would aſcribe the origin of the works in queſtion: but the objection occurs very ſtrongly, that the walls in Scotland are vitrified, and it is not to be ſuppoſed that ſuch trouble

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would be taken with fences made in ſuch a fortuitous manner. This objection, our author owns, would indeed be unanſwerable, on the ſuppoſition that the vitrification was made on purpoſe to ſtrengthen the walls of the fortreſs; but (ſays he) may not the vitrification have been occaſioned by volcanoes, or by what are called *bloomeries?* The ſame effect may be produced likewiſe on dry walls of ſtone by lightning paſſing along them. The looſe ſtones in either caſe would not be rejected becauſe they were glaſſy, and would be piled up in the fence of the encloſure: as the great point upon theſe occaſions is to clear the ground, and remove the encumbering ſtones to the ſmalleſt diſtance. One of the advocates for the deſigned and not fortuitous vitrification, ſays, that the pieces he had procured did not reſemble what is called *lava*. But every volcano is not neceſſarily an Etna or a Veſuvius; and conſequently the matter diſgorged from the crater muſt perpetually vary both in ſubſtance and form. Vitrified maſſes, larger or ſmaller, will likewiſe be produced by the ſame means. It may be contended, indeed, that paſture thus procured, by clearing the ground, would be more convenient at the bottom or on the ſides, than on the top of the hill: but to this I anſwer, that in rocky countries you muſt get what pittance you can of ſoil, and often it will happen that the only detached and removeable ſtones are on the ſummit. When ſuch encloſures have been made, they became very convenient for putting cattle into; and hence perhaps ſome of the wells which Mr Williams hath mentioned."

Our author concludes his diſſertation on this ſubject by obſerving, that if vitrification anſwered the purpoſe of cement, it is very extraordinary that the ancient inhabitants of Scotland did not apply it to the houſes or huts in which they conſtantly lived, but reſerved this troubleſome and expenſive proceſs merely for a fortification, which might not perhaps be uſed in half a century againſt an enemy. On this it is almoſt ſuperfluous to obſerve, that in the ages of barbarity and bloodſhed, in which theſe encloſures, whether natural or artificial, were ſuppoſed to be uſed as fortreſſes, war was ſo frequent, that a defence againſt an enemy might ſeem to be neceſſary every day, inſtead of once in half a century. Before we proceed further in the argument, however, it will be neceſſary to give ſome account of the ſituation and appearance of theſe fortreſſes.

According to Mr Cardonnel, the largeſt of them is ſituated on the hill of Knockfarrill, to the ſouth of the valley of Strathpeffer, two miles weſt from Dingwall in Roſsſhire. The encloſure is 120 feet long and 40 broad within the walls; ſtrengthened on the outſide with works at each end. A range of habitations ſeems to have been erected againſt, or under, the ſhade of the outward wall; of which thoſe on the ſouth ſide ſeem to have been higher and larger than thoſe on the north. There are two wells in the middle, which, on being cleared out, filled with water. On the ſkirts of the hill to the ſouth are many detached buildings; which, from the ſtratum of dung found on removing the ruins, appear plainly to have been uſed for ſecuring the cattle. This place ſeems to have been anciently of conſequence, and the reſidence of ſome powerful chief, from a road which leads through the hills to the north-weſt ſea. To the eaſt of the works are a number of vitrified ruins, extending for a conſiderable way along the ridge of the hill. The end next the fort ſeems to have joined the outer wall, and conſiſted either of two parallel walls, cloſed above, with a paſſage between them under cover, or a high wall broad enough to walk on. In this wall there is the veſtige of a break about the middle, over which a bridge has been laid, to be drawn up or removed as occaſion might require.

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The fort next in conſequence to that of Knockfarril is ſituated on the hill of Craig-Phadrick near Inverneſs, "which (ſays Mr Cardonnel) has this peculiar circumſtance, that there appears to have been two vitrified walls quite round the area. The inner one ſeems to have been very high and ſtrong; the outer wall but low: probably the ſpace between was intended for ſecuring their cattle, as there are no remains of dry-ſtone buildings, ſuch as are found near the reſt. Several parts of this outer wall appear quite entire, ſticking to the firm bare rock, where it was firſt run. The area within the inner wall is near 80 paces long and 27 broad." Of this we have an account * by Alexander Fraſer-Tytler, Eſq. profeſſor of civil hiſtory in the univerſity of Edinburgh, who viſited it in the year 1782. The hill itſelf is a ſmall conical eminence, forming the eaſtern extremity of that ridge of mountains which bounds Loch Neſs on the north-weſt ſide. It is ſituated about a mile to the north of Inverneſs, and is acceſſible on two different quarters, viz. the weſt and ſouth-eaſt; the former affording entrance by a narrow level ridge joining the hills on Loch Neſs, and the latter by an eaſy aſcent from the high ground above Inverneſs. On approaching the hill from the weſt, we firſt meet with a road cut through the rock from the bottom to the top, in moſt places 10 feet broad and nearly as deep; winding, for about 70 feet, with an eaſy ſerpentine direction, by which we gain an aſcent over a ſteep rock otherwiſe quite inacceſſible from that quarter. This road, in our author's opinion, is undoubtedly the work of art, and the vitrified matter on the top is the only thing which indicates the effect of fire; there being neither an appearance of pumice-ſtone, lava, nor baſaltes, about the hill otherwiſe. There is indeed plenty of plum-pudding ſtone; which ſome have ſuppoſed to be of the nature of volcanic tufa; but this opinion is rejected by our author as erroneous. "But the circumſtance (ſays he) which in my apprehenſion evinces, in the moſt ſatisfactory manner, that theſe appearances of the effect of fire on the ſummit of this hill are not the operation of nature but of art, is the regular order and diſpoſition of thoſe materials, the form of the ground, and the various traces of ſkill and contrivance which are yet diſcernible, though conſiderably defaced either by external violence or the obliterating hand of time." To inveſtigate this matter regularly, he begins with the winding road already mentioned, and which is evidently cut through the rock for the purpoſe of gaining an eaſy aſcent from the level ridge to the ſummit, which would otherwiſe have been impracticable. In aſcending by this road, there appears, towards the middle, on the right hand, a ſmall platform overhanging the paſſage, and inclining by a very gentle declivity to the very edge of the rock. Four enormous ſtones are placed upon the platform, and on the edge and extremity

* *Edin. Phil. Tranſact.* Vol II. Claſs II. Art. 11.

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extremity of it, which have evidently been guided by art into that poſition; it being impoſſible that they could have reſted there, had they been rolled down from the higher parts. The obvious reaſon for placing them in ſuch a poſition has been, that on an alarm of danger they might be projected into the path below, which could be done by the efforts of a very few men: and when this was done, the paſſage would be entirely obſtructed, or at leaſt rendered ſo difficult that it could be defended by a few againſt any number of aſſailants. Some other large ſtones are placed on an eminence to the left, probably with a view to block up a hollow channel, by which an enemy might have attempted to aſcend. When we come to the top of the hill, a few feet below the rampart which crowns the whole, there appears an outward wall, approaching on the ſides of the hill ſo near the upper rampart, as to have only a trench of 10 or 12 feet wide between them. This outward wall is in ſome places ſo low as to be almoſt level with the rock, though in other places it riſes to the height of two or three feet; but even where loweſt, it may be traced by a line of vitrified matter ſticking faſt to the rock all along, and nearly of the ſame breadth, which is about nine feet. The remains of this wall are ſtrongly vitrified, except in one place on the north ſide, where, for about 70 yards, the rampart is formed only of dry ſtones and earth. At the eaſt ſide, where the hill is more acceſſible, there is a prodigious mound of vitrified matter, extending itſelf to the thickneſs of above 40 feet. At the ſouth-eaſt corner, and adjoining to this immenſe mound, is an outwork, conſiſting of two ſemicircular vitrified walls, with a narrow paſs cut through them in the middle; which appears to have been another, and perhaps the principal entry to the fort.

The inner wall, ſurrounding the ſummit of the hill, encloſes an oblong level area of about 75 yards long and 30 broad, rounded at each of the ends like the outward wall. It is of conſiderable height, and nearly of the ſame thickneſs with the outward one.—It has ſome appearance of having been defended with four turrets or baſtions: but the traces are ſo imperfect, that Mr Tytler does not lay much ſtreſs on his obſervations in this reſpect; a number of ſmall tumuli of earth, with a ſtone in the centre, were more diſcernible. On the eaſt ſide a portion of the internal ſpace appears ſeparated from the reſt by two ranges of ſtones fixed ſtrongly in the earth, and forming a right-angled parallelogram. "This ſeparation (ſays our author) is immediately diſcernible by the eye, from this circumſtance, that the whole of the encloſed ſummit has been moſt carefully cleared from ſtones, of which there is not one to be ſeen, unleſs thoſe that form this diviſion, and the ſingle one in the middle of the circle of tumuli above mentioned. What has been the deſign of this ſeparated ſpace, it is difficult to conjecture. It might perhaps have marked the reſidence of thoſe of a higher rank, or ſerved as a temple for the purpoſes of devotion." On the eaſt end of the large area on the ſummit is a well of about ſix feet in diameter, which has probably been ſunk very deep in the rock, though now it is filled up with rubbiſh to within a yard of the top.

The other fortified hills mentioned by Mr Cardonnel are thoſe of Dun-Evan in the ſhire of Nairn; Tordun caſtle, near Fort Auguſtus; and another on the weſt ſide of Gleneves in Lochaber, three miles to the ſouth of Fort William. The Caſtle hill of Finhaven, in the county of Angus, has likewiſe ſome conſiderable ruins of the ſame kind. Vitrified Forts.

Dun-Evan and the hill of Finhaven have likewiſe been viſited by Mr Tytler, who gives an account of them in the paper already quoted; of which the following is an abſtract. "On the ſummit of the hill of Dun-Evan, whoſe name implies that it had been originally a place of defence, are the remains of two walls ſurrounding an oblong ſpace like that of Craig Phadriek already deſcribed, but ſomewhat ſmaller in ſize. [Mr Cardonnel ſays that it is about 70 paces long and 30 broad]. There are likewiſe the traces of a well in the encloſed area; and at the eaſt end are the remains of a prodigious maſs of building, much more extenſive than that on Craig Phadrick." Here, however, our author could not perceive any marks of fire; and Mr Williams owns that the vitrified ruins here are more waſted than on Knockfarril or Craig Phadrick. But with regard to the vitrifications here, our author is inclined to ſuppoſe Mr Williams to have been entirely in a miſtake. On the Caſtle hill of Finhaven, however, the vitrified remains are very viſible all round the ſummit, which is cleared of ſtones and levelled, unleſs at one end, where there is a great hollow ſpace ſeparated from the reſt of the area, and probably deſtined excluſively for the keeping of cattle. The encloſed area is about 140 yards long, and upwards of 40 broad.

Beſides theſe fortifications, the hill of Noth affords a remarkable appearance of the ſame kind: of which Mr Cordiner gives the following deſcription, not from his own obſervation, but thoſe of a gentleman of credit who viſited the place. "On the top of the hill there is an oblong hollow, as I could gueſs, of about an Engliſh acre, covered with a fine ſward of graſs: in the middle toward the eaſt end of this hollow is a large and deep well. The hollow is ſurrounded on all ſides with a thick rampart of ſtones. On three ſides of this rampart, from 8 to 12 feet thick, is one compact body of ſtones and minerals which have been in a ſtate of fuſion, reſembling a mixture of ſtone and iron-ore, all vitrified, calcined, and incorporated. On the north ſide the rampart conſiſts of broken pieces of rock, which have the appearance of having been torn to pieces by ſome extraordinary violence. If the calcined compact wall exiſts under them, it is not at preſent viſible."

Such are the deſcriptions of the moſt remarkable of theſe curious fortifications, which of late ſeem to have engaged the attention of the learned in a conſiderable degree. We have already taken notice, that by ſome they are ſuppoſed to be the works of art, by others the productions of a volcano. Mr Cardonnel adopts the opinion of Mr Williams as the moſt probable, both with reſpect to their uſe and manner of conſtruction. Mr Tytler takes notice of the remarkable difference of opinion among thoſe who have viewed the places in queſtion. "It is curious to remark (ſays he) how the ſame appearances, to different obſervers, lead to the moſt oppoſite opinions and concluſions. The two gentlemen above mentioned (Mr Williams and Dr Anderſon) ſeem not to have entertained the ſmall-

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eſt doubt, that the vitrified materials on the tops of theſe hills were the veſtiges of works of art, and the remains of ſtructures reared for the purpoſes of ſecurity and defence. The biſhop of Derry, when on a tour to the north of Scotland, viſited the hill of Craig Phadrick near Inverneſs, and expreſſed his opinion, that the mounds of vitrified matter were not the remains of any artificial work, but the traces of an ancient volcano. In the Phil. Tranſ. of the Royal Society of London for 1777, Part II. N° 20. is an account of *Creck Faterick*, there termed *a Volcanic hill near Inverneſs*, in a letter from Thomas Weſt, Eſq. to Mr Law, F. R. S. in which the writer does not heſitate to pronounce this hill an extinguiſhed volcano; and having ſent ſpecimens of the burnt matter for the inſpection of the Royal Society, the ſecretary ſubjoins a note to the paper, intimating, that theſe ſpecimens having been examined by ſome of the members well aequainted with volcanic productions, were by them judged to be real lava. Such was likewiſe the opinion of the late Andrew Croſbie, Eſq. who, in an account which he gave to the Philoſophical Society of Edinburgh in 1780, offered ſome very curious conjectures with regard to the proceſs of nature, by which he ſuppoſed the whole of this hill to have been thrown up from the bottom of the ſea by the operation of inteſtine fire.

Mr Tytler agrees with thoſe who think the vitrified ſtructures to be artificial works: but he differs from Mr Williams and others, who think that they were vitrified on purpoſe for cementing the materials together. His reaſon for this is, that the number of forts that ſhow marks of vitrifieation, is conſiderable when compared with thoſe that do not. He therefore conſiders the vitrification as accidental; and that it muſt have been accompliſhed in the following manner. In the rude ſtate in which we muſt ſuppoſe Scotland to have been in early times, it is very probable that their buildings, both for habitation and defence, would be frequently conſtructed of looſe ſtones of an irregular ſhape; of which, by themſelves, it would ſearee be poſſible to fabricate a wall of any tolerable ſtrength. Hence it became neceſſary to uſe wood as well as ſtone in their conſtruction. This kind of building, then, in our author's opinion, was begun by raiſing a double row of palliſades or ſtrong ſtakes in the form of the intended ſtructure, in the ſame way as in that ancient mode of building deſcribed by Palladio under the name of *riempiuta à caſſa*, or coffer-work. Theſe ſtakes were probably warped acroſs by boughs of trees laid very cloſely together, ſo as to form two fences running parallel to each other at the diſtance of ſome feet, and ſo cloſe as to confine all the materials of whatever ſize that were thrown in between them. Into this intermediate ſpace Mr Tytler ſuppoſes were thrown boughs and trunks of trees, earth and ſtones of all ſizes, large or ſmall as they could quarry or collect them. Very little care would be neceſſary in the diſpoſition of theſe materials, as the outward fence would keep the mound in form. In this way it is eaſy to conceive that a very ſtrong bulwark might be reared with great diſpatch; which, joined to the natural advantage of a very inacceſſible ſituation, and that improved by artful contrivances for increaſing the difficulty of acceſs, would form a ſtructure capable of anſwering every purpoſe of ſecurity or defence. The moſt formidable attack againſt ſuch a building would be fire, which would no doubt be always attempted, and often with ſucceſs, by an enemy who undertook the ſiege. If the beſiegers prevailed in gaining an approach to the ramparts, and, ſurrounding the external wall, ſet fire to it in ſeveral places, the conflagration muſt ſpeedily have become univerſal, and the effect may be eaſily imagined. If there happened to be any wind at the time to increaſe the heat, the ſtony parts could not fail to come into fuſion; and as the wood burnt away, ſinking by their own weight into a ſolid maſs, there would remain a wreck of vitrified matter tracking the ſpot where the ancient rampart had ſtood; irregular, and of unequal height, from the fortuitous and unequal diſtribution of the ſtony materials of which it had been compoſed. This conjecture appears very probable from their appearance at this day. They do not ſeem to have ever been much higher than they are at preſent, as the fragments that have fallen from them, even where the wall is loweſt, are very inconſiderable. The durable nature of the materials would prevent them from ſuffering any changes by time; though from the gradual increaſe of the ſoil, they muſt in ſome places have loſt conſiderably of their apparent height, and in others been quite covered. Mr Williams, in making a cut through the ramparts at Knockfarril, found in many places the vitrified matter covered with peat moſs half a foot thick.

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In confirmation of this opinion, our author likewiſe urges that in the fortification on Craig Phadrick, a large portion of the outward rampart bears no marks of vitrification. The reaſon of this ſeems to be, that the ſteepneſs of the hill on that ſide renders a low fence of ſtones and turf ſufficient; and no wood had probably been employed in its conſtruction. "It appears therefore highly probable (concludes our author), that the effect of fire upon theſe hill fortifications has been entirely accidental; or to ſpeak more properly, that fire has been employed not in the conſtruction, but towards the demolition of ſuch buildings: and for the latter purpoſe it would certainly prove much more efficacious than for the former. It is much to be doubted, whether it would be at all poſſible, even in the preſent day, by the utmoſt combination of labour and of ſkill, to ſurround a large ſpace of ground with a double rampart of ſtones compacted by fire, of ſuch height and ſolidity as to anſwer any purpoſe of ſecurity or defence againſt an enemy. Any ſtructure of this kind muſt have been irregular, low, fragile, eaſily ſealed, and quite inſecure; a much weaker rampart, in ſhort, than a ſimple wall of turf or wooden palliſade. The veſtiges yet remaining, as I have already obſerved, give no room to ſuppoſe that the vitrified mound has ever been much more entire than it is at preſent. The effect of fire upon ſtructures reared in the manner I have ſuppoſed them to have been, will account moſt perfectly for their preſent appearance. It was from neceſſity that the builders of theſe fortifications betook themſelves to a mode of ſtructure ſo liable to be deſtroyed by fire. In thoſe parts where ſtones could be eaſily quarried, of ſuch ſize and form as to rear a rampart by themſelves of ſufficient ſtrength and ſolidity, there was no occaſion to employ wood or turf in its conſtruction; and it was therefore proof againſt all aſ-

faults

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faults by fire. Such are the ramparts which appear on the hill of Dun-Jardel, Dun-Evan, and many others, on which there is not the ſmalleſt appearance of vitrification. But on Craig Phadrick, and the other hills, above deſcribed, where, from the nature of the rock, the ſtones could be procured only in irregular and generally ſmall fragments, it was neceſſary to employ ſome ſuch mode of conſtruction as I have ſuppoſed; and theſe ramparts, though ſolid and well calculated for defence againſt every attack by force or ſtratagem, were not proof againſt an aſſault by fire."

Mr Cordiner is of opinion, that the vitrifications in queſtion cannot have been the works of art, and ridicules the contrary hypotheſis; though without adducing any argument againſt it. The hill of Noth is by him ſuppoſed to have been a volcano. He deſcribes it as "a moſt majeſtic mountain, in general brown, with moſs and heath, interſperſed with bare rock, in many places crumbling down. The higheſt part of it is a circular hill, whoſe verdure, as well as height, diſtinguiſhes it from the reſt of the mountain. This is called the *Top of Noth;* and bears the ſtrongeſt reſemblance to every deſcription of a volcanic mount. At the diſtance of many miles, one can diſtinguiſh thoſe ridges which are the boundaries of the crater, indicating the hollow in the top." The gentleman from whom Mr Cordiner received the account of the vitrifications on the ſummit, informs us, that on firſt ſeeing ſpecimens of them, he imagined that they had been pieces of ſtone calcined by the burning down of a caſtle; as he had found ſomething very like them on the caſtle-hill at Cullen, in parts where the ſward of graſs was broken; but on reaching the top, and viewing the appearances on it already deſcribed, he altered his opinion. "That men hardly beſet (ſays he) might climb up with ſome proviſions to this as a place of refuge, is probable: but that, on a barren mountain top, far from cultivated ground, half a day's journey from the plain; that there, in any period of ſociety, man ſhould have been tempted to build that amazing rampart, is not to be imagined: they have found it a natural and extenſive fortreſs, and in critical circumſtances have made uſe of it accordingly. That it has been occupied as a place of ſtrength and of refuge, is very evident; for, ſome hundred yards lower down on the hill, there are the remains of another rampart or wall, conſiſting of looſe ſtones piled together without any cement, carried quite round the hill. This laſt has been built for an additional defence to thoſe who made their abode on the top. The top of Noth, for two-thirds downwards, is covered with a green ſward; below that, it is brown with heath: this is the very reverſe of the adjacent mountains; and the greater verdure of the upper part I imputed to a new ſoil created by the aſhes of the volcano. The opening, called a *well*, I ſuppoſe to have been the lateſt crater. About a mile ſouth, down towards the lower grounds of the *Cabrock*, there is a very pretty regular green hill, which I aſcribe to a later eruption than thoſe which may have formed the contiguous hills now covered with heath. There is an extraordinary luxuriant ſpring of water ruſhes out at once from the ſide of the hill of Noth; which is likewiſe ſome confirmation of the opinion that a volcano has ſome time exiſted there which has occaſioned great hollows and reſervoirs of water in the heart of the mountain. And the wild irregularities of nature through all the Cabrock, the hideous and ſtrange projection of rocks from the ſides of the hills, would ſeem to indicate ſome vaſt convulſions which the earth muſt have ſuffered in theſe parts.

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"The traces of ancient volcanoes (ſays Mr Cordiner) are far from being unfrequent in Scotland. The hill of Finhaven is one inſtance; and not only abundant in this ſpecies of lava, but with *tarras*, or the *pulvis puteolanus*, an *amalgama*, as Condamine calls it, of calcined ſtones mixed with ſcorias and iron ruſt reduced to powder. The hill of Beregonium, near Dunſtaffnage caſtle, is another yielding vaſt quantities of pumice or ſcoria of different kinds; many of which are of the ſame ſpecies with thoſe of the volcanic Iceland. The noble aſſemblage of baſaltic columns at Staffa, thoſe in the iſle of Sky, and the rock Humble, are but ſo many evidences of the ancient volcanoes of this country. And finally, the immenſe ſtratum of pumex vitreus or Iceland agate, on the hill of Dun-ſnin in Arran, is the laſt proof I ſhall bring in ſupport of the queſtion."

On this diſpute we can only obſerve, that whatever ſide we embrace, the difficulties ſeem to be very great, nay almoſt inſurmountable. When we conſider the great thickneſs of the walls on the top of Noth, from 8 to 12 feet, and the vaſt mound of vitrified matter, no leſs than 40 feet in breadth, mentioned by Mr Tytler, we can ſcarce conceive it poſſible that leſs than a volcanic fire could be able to form them. We may eaſily allow, that, in the way this gentleman mentions, there might be conſiderable vitrifications formed; but that ſuch immenſe maſſes ſhould be brought into perfect fuſion by the ſmall quantity of fuel which could be put round them in palliſades, or intermixed with the materials themſelves, will be incredible to every one acquainted with the extreme difficulty with which ſtones of any magnitude are brought into complete fuſion. We ſee even in the inſides of furnaces, though ſometimes built of no more infuſible materials than common brick, no ſuch effects follow. There is a ſlight vitrification indeed, but it ſcarcely ever penetrates to the depth of an inch or two, though very violent fires are kept up for a much longer time than we could ſuppoſe the wood ſurrounding thoſe walls to require for its being conſumed. In conflagrations, where houſes are conſumed, which are the only ſimilar examples we have, no ſuch effect is perceived. Even in the great fire at London in 1666, where ſo many buildings were deſtroyed, we do not hear of their walls being vitrified, though the materials of many of them were undoubtedly as fuſible as the rocks and ſtones of Craig Phadrick, or the Top of Noth. If, on the other hand, we reject this, and adhere to the volcanic hypotheſis, our difficulties are equally great. For where ſhall we find, in any other part of the world, an example of volcanoes ejecting lava in the form of walls encloſing a regular area? This would be attributing ſuch a ſingularity to the volcanoes of Scotland as the moſt extravagant imagination cannot admit. We muſt therefore conclude, that though theſe ruins are certainly the works of art, we have not yet ſufficient data to decide the queſtion with reſpect to their conſtruction, but that the ſubject requires a farther inveſtigation.

Vitrified Forts || Forteſcue

In the paper already quoted, Mr Tytler obſerves, that "theſe ancient fortifications preſent a more curious and intereſting object of ſpeculation, than thoſe uncertain and indeed fruitleſs conjectures as to the mode in which they have been reared." This, he juſtly obſerves, muſt have been before the uſe of mortar was known; for as the country abounded in limeſtone, and the builders certainly would exert all their powers in giving them a proper degree of ſtrength, it would undoubtedly have been uſed. Hence we are led to aſcribe to theſe a very conſiderable degree of antiquity; for as the Britons were taught the uſe of mortar by the Romans, it is probable that we muſt date the origin of the ſtructures in queſtion before the time of the invaſion of that people, or at leaſt ſoon after it; ſo that we muſt look upon them to be more than 1650 years old; but how far beyond that period we are to ſearch for their origin, does not appear. "All that we can conclude with certainty (ſays our author) is, that they belong to a period of extreme barbariſm. They muſt have been conſtructed by a people ſcarcely removed from the ſtate of ſavages, who lived under no impreſſion of fixed or regulated property in land; whoſe only appropriated goods were their cattle; and whoſe ſole ſecurity, in a life of conſtant depredation, was the retreat to the ſummits of thoſe hills of difficult acceſs, which they had fortified in the beſt manner they could. As the ſpace encloſed was incapable of containing a great number of men, eſpecially if occupied in part by cattle, it is preſumed, that theſe retreats were formed chiefly for the ſecurity of the women and children of the canton, and of their herds. They could be defended by a few men, while the reſt of the tribe were engaged with their enemies in the field."

Our author concludes his diſſertation with a conjecture, that the forts in queſtion were conſtructed, not only before the Roman invaſion, but before the introduction of the rites of the Druids into Britain.

FORTALICE, in *Scots Law*, ſignified anciently a ſmall place of ſtrength, originally built for the defence of the country; and which on that account was formerly reckoned *inter regalia*, and did not go along with the lands upon which it was ſituated without a ſpecial grant from the crown. Now, fortalices are carried by a general grant of the lands; and the word is become ſynonymous with manor-place, meſſuage, &c.

FORTAVENTURA, one of the Canary iſlands, 50 miles long, and from 8 to 24 broad, fertile in corn and excellent fruits; and remarkable for its numerous breed of goats and prodigious quantity of goat-milk cheeſe. The number of inhabitants amounts to 10,000. W. Long. 14. 32. N. Lat. 28. 4.

FORTESCUE, Sir John, lord chief juſtice of the King's Bench, and lord high chancellor of England, in the reign of King Henry VI. was deſcended from the ancient family of Forteſcue, in the county of Devon. He ſtudied the municipal laws of England in Lincoln's Inn, of which he was made one of the governors in the fourth and ſeventh years of the reign of King Henry VI. In 1430, he was called to the degree of a ſerjeant at law, and in 1441 was conſtituted the king's ſerjeant. The following year he was made lord chief juſtice of the King's Bench; in which honourable ſtation he continued till near the end of that king's reign, who ſhowed him many particular marks of his favour, and advanced him to the poſt of lord high chancellor of England. During the reign of King Edward IV. he followed the fortunes of the houſe of Lancaſter, and was many years in exile with Queen Margaret and Prince Edward her ſon. At length they having a proſpect of retrieving their deſperate fortunes, the queen and prince returned to England, and Sir John Forteſcue, with many others, accompanied them; but ſoon after the deciſive battle of Tewkeſbury, he was thrown into priſon and attainted, with other Lancaſtrians; but found means to procure his pardon from Edward IV. He wrote, 1. A learned commentary on the politic laws of England, for the uſe of Prince Edward; to one edition of which Mr Selden wrote notes. 2. The difference between an abſolute and limited monarchy, as it more particularly regards the Engliſh conſtitution (which was publiſhed, with ſome remarks, by John Forteſcue, afterwards Lord Forteſcue, in 8vo, in 1714; and a ſecond edition was publiſhed with amendments, in 1719): And ſeveral works, which ſtill remain in manuſcript. He died near 90 years of age; and was buried in the pariſh church of Ebburton, where a monument was erected to his memory, in 1677, by one of his deſcendants. Forteſcue, Forth.

FORTH, one of the moſt noble and commodious rivers in Scotland. It takes its riſe near the bottom of Ben-Lomond; and running from weſt to eaſt, receives in its paſſage many conſiderable ſtreams, deriving their waters from the eminences in the midland counties of North Britain. Between Stirling and Alloa, the Forth winds in a moſt beautiful and ſurpriſing manner; ſo that, though it is but 4 miles by land, it is 24 by water between thoſe two places. Below Alloa the river expands itſelf to a great breadth between the counties of Lothian and Fife, till at Queenſferry it is contracted by promontories ſhooting into it from both coaſts; ſo that, from being four or five, there it is not above two miles broad. In the middle of the channel lies a ſmall iſland called *Inchgarvy*, which has a ſpring of freſh water: upon the iſland there is an ancient fort, which has been lately repaired; and if there were either forts or blockhouſes on the oppoſite promontories, that part of the river which lies between Alloa and Queenſferry would be as ſecure and convenient a harbour as could be deſired. A little below this, near the north ſhore, lies Inchcolm, on which are the remains of an ancient monaſtery of conſiderable extent; and oppoſite to Leith ſtands the iſland of Inchkeith, formerly fortified, but now furniſhed with a light-houſe. Below Queenſferry the north and ſouth ſhores receding, the body of the water gradually enlarges till it becomes two or three leagues broad, affording ſeveral ſafe harbours on both ſides, and excellent roads throughout, unembarraſſed with latent rocks, ſhoals, or ſands; and allowing ſecure anchorage to the largeſt ſhips within a league of the coaſt in almoſt any part of the Frith, and to veſſels of a ſmaller ſize within a mile or leſs. The Firth, or (as it is commonly written) the *Frith*, of Forth, is, at the mouth of it, from North Berwick to Fifeneſs, full five leagues broad; having the little iſland of May (on which there is a light-houſe, and there might alſo be a fort) in the middle of it, and to the weſt of this the rocky iſland of Baſs; notwithſtanding

Forth

ſtanding which, the largeſt fleet may enter and ſail up it many miles with the utmoſt facility and in the greateſt ſafety. In 1781, Admiral Parker's fleet lay ſome weeks oppoſite to Edinburgh, accompanied by 500 ſail of merchantmen, the whole in full view of the city and caſtle.

The Forth was known to the ancients by the name of *Bodotria*, or (as Ptolemy calls it) *Boderia*, and has been ever famous for the number of its havens: ſome of which are, indeed, in their preſent condition, ſcarce worthy of that name. It is navigable for merchantmen as high as Alloa, 50 miles from the ſea; and for coaſters as far as Stirling, 24 miles further by water, though only four by land in a direct line, as already obſerved. The tide flows only a full mile above Stirling to a place called *Craigforth*, where the proprietor intercepts the paſſage of the ſalmon by a cruive or wear, very injurious to the large tract of country which ſtretches as far as Lomond weſtward. The river from Stirling to the bridge of Aberfoil, at the entrance into the Weſt Highlands, is only paſſable for man or horſe at few places, and theſe in dry ſeaſons. It glides gently through a dead flat, from Gartmore eaſtward; "and on theſe accounts (ſays Mr Knox*) it might be made navigable for barges, at a trifling expence to the proprietors of the lands, an improvement much wanted in a rich, extenſive, and populous valley, without market towns, coal and lime. Suppoſing this work to be executed, of which there is ſome probability, the whole extent of navigation on the Forth, will, including all its windings, exceed 200 miles, through a coaſt of nearly 100 miles; fertile, populous, induſtrious; and from Stirling eaſtward, almoſt lined with towns, anciently the ſeats of commerce and navigation, till they were ruined by the Engliſh depredations; in which miſerable ſtate ſome of them ſtill remain, while others begin to reſume the appearance of buſineſs. The principal object of theſe towns was the fiſheries; which they proſecuted with great vigour as far as Iceland, till the time of the Union, from which period the eaſtern fiſheries gradually dwindled away; and the poor fiſhermen, unable to ſubſiſt themſelves upon air and water, took up the trade of ſmuggling; but ſo ſoon as the fiſhery laws ſhall be amended, the ſalt duties aboliſhed, and an adequate bounty extended to boats as well as buſſes, theſe people will readily fall into the track of their anceſtors, live by honeſt induſtry, and add new vigour to our naval ſtrength. Many of the ports are nearly choked up, others want repairs, which neither the individuals nor the corporations of thoſe decayed places can accompliſh. Though the harbours on the Forth are in general ſmall, the depth of water might be made ſufficient for veſſels of 200 tons burden, which fully anſwer the purpoſes of their coaſting and Baltic trade; but to obtain this, or even a leſs depth of water, an aid of 50,000l. would be requiſite."

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By this river and the Clyde, Scotland is almoſt divided into two parts. The Forth falls into the eaſt ſea below Edinburgh, and has an eaſy communication with the whole eaſtern coaſt of Great Britain; with France, Oſtend, Holland, Hamburgh, Pruſſia, Dantzic, Ruſſia, Sweden, Denmark, Norway, and Greenland. The Clyde falls into the Atlantic ocean below Glaſgow, and communicates with the weſtern coaſt of Great Britain; with Ireland, the ſouth of France, Portugal, Spain, the Mediterranean, America, and the Weſt Indies. Theſe two rivers, thus falling in oppoſite directions into the two ſeas which environ our iſland, and the neck of land between them amounting ſcarcely to 24 miles, gave riſe to the idea of a junction, ſo as to open a communication acroſs the kingdom, and thereby cut off the long dangerous navigation by the Land's End and the Pentland Frith: an object of vaſt utility, and which has been happily accompliſhed. See CANAL.

* *View of the Britiſh Empire*, vol. ii. p. 518.

FORTIFICATION;

THE art of fortifying a town, or other place; or of putting it in ſuch a poſture of defence, that every one of its parts defends, and is defended by, ſome other parts, by means of ramparts, parapets, moats, and other bulwarks; to the end that a ſmall number of men within may be able to defend themſelves for a conſiderable time againſt the aſſaults of a numerous army without, ſo that the enemy in attacking them muſt of neceſſity ſuffer great loſs.

The origin and riſe of fortification is undoubtedly owing to the degeneracy of mankind. In the firſt ages of the world, men were diſperſed up and down the countries in ſeparate families, as we are told in the hiſtories of the Jews and Scythians, who wandered from one place to another, for the ſake of finding paſture for their cattle. Theſe families became in time ſo numerous as to form large communities, which ſettled all together in a place; from whence villages and towns had their origin and riſe; but they found it was neceſſary, for the common ſecurity, to ſurround thoſe towns with walls and ditches, to prevent all violences *from their neighbours, and ſudden ſurpriſes*. This was ſufficient for ſome time, till offenſive weapons were invented, and conquering became a faſhion. Then walls with loop holes were made at proper diſtances, in order to ſcreen the defenders againſt the arrows of the aſſailants: but finding that, as ſoon as the enemy got once cloſe to the walls, they could from no part be diſcovered or repulſed; for this reaſon they added ſquare towers at proper diſtances from each other, ſo that every part of the wall might be defended, by the adjacent ſides of the towers. This manner of encloſing towns, however, was found to be imperfect, becauſe there remained ſtill one of the faces of the towers which fronted the field that could not be ſeen from any other point, and therefore could not be defended. To remedy this, they made the towers round inſtead of ſquare, imagining this figure to be ſtrongeſt to reſiſt the battering engines, as likewiſe to be better defended from the other parts of the wall.

Notwithſtanding the ſuperiority of this method above the former, there remained yet a part of theſe

Vauban's Method.

towers unſeen and incapable of being defended; which made them change the figure of the towers again; that is, they made them ſquare as before; but, inſtead of preſenting a face to the field as formerly, they preſented an angle; by this means they effectually found out ſuch a diſpoſition of their works that no part could be attacked without being ſeen or defended by ſome other part.

This laſt method was long in uſe; and would in all probability have continued to this day, if gunpowder had not been found out; but the violence of the guns and mortars ſoon convinced the world, that ſuch towers and walls were but a weak defence againſt theſe thundering engines; and beſides, as the nature of the attack was entirely changed, it was alſo neceſſary to change that of fortifying likewiſe.

From that time ramparts were added to the walls, the towers enlarged into baſtions, and all ſorts of outworks have been added, ſuch as ravelins, counterguards, horn and crown works, and others of the like nature, in order to render the defence in ſome meaſure equivalent to the attack.

Notwithſtanding all the improvements which have been made in the art of fortifying ſince the invention of gunpowder, that of attacking is ſtill ſuperior to it; engineers have tried in vain to render the advantages of a fortification equal to thoſe of the attack; the ſuperiority of the beſiegers fire, together with the greater number of men, obliges generally, ſooner or later, the beſieged to ſubmit.

The greateſt improvement made in the art of attacking happened in the year 1697, when M. Vauban made firſt uſe of ricochet firing at the ſiege of Ath, whereby the beſieged placed behind the parapets were as much expoſed to the fire of the beſiegers as if there had been none; whereas, before, they had been ſecure as long as the parapet was not demoliſhed; and the worſt is, that there can be no remedy found to prevent this enfilading, without falling into inconveniences almoſt as bad as thoſe which we endeavour to avoid.

Fortification is either regular or irregular. *Regular* fortification, is that built in a regular polygon, the ſides and angles of which are all equal, being commonly about a muſket ſhot from each other. *Irregular* fortification, on the contrary, is that where the ſides and angles are not uniform, equidiſtant, or equal; which is owing to the irregularity of the ground, valleys, rivers, hills, and the like.

Sect. I. *Of Regular Fortification.*

Although authors agree as to the general form in the preſent manner of fortifying, yet they moſtly differ in particular conſtructions of the parts. As it would be both needleſs and ſuperfluous to treat of all the different methods hitherto propoſed, we ſhall content ourſelves with explaining thoſe only which are moſt eſteemed by the beſt judges, and have been moſtly put in practice.

Conſtruction of M. Vauban's Method.

This method is divided into little, mean, and great; the *little* is chiefly uſed in the conſtruction of citadels, the *mean* in that of all ſorts of towns, and the *great* in particular caſes only. Vauban's Method.

We ſhall give the conſtruction of the mean, as being moſt uſeful; and refer the reader to the table hereafter, for thoſe dimenſions which are different in theſe ſeveral fortifications.

Plate CCXXI. fig. 1.

Inſcribe in the circle a polygon of as many ſides as the fortification is deſigned to have fronts; let AB (fig. 1.) be one of the ſides of half an hexagon, which biſect by the perpendicular CD; divide half AC of it into nine equal parts, and one of theſe into ten others; then theſe diviſions will ſerve as a ſcale to conſtruct all the parts of the fortification, and each of them is ſuppoſed to be a toiſe or fathom, that is, ſix French feet; and therefore the whole ſide AB is ſuppoſed to be 180 toiſes.

As the dividing a line into ſo many equal parts is troubleſome and tedious, it is more convenient to have a ſcale of equal parts by which the works may be conſtructed.

If therefore, in this caſe, the radius is taken equal to 180 toiſes, and the circle deſcribed with that radius being divided into ſix equal parts, or the radius being carried ſix times round, you will have a hexagon inſcribed; AB being biſected by the perpendicular CD as before, ſet off 30 toiſes from C to D, and draw the indefinite lines ADG, BDF; in which take the parts AE, BH, each equal to 50 toiſes: from the centre E deſcribe an arc through the point H, meeting AD in G, and from the centre H deſcribe an arc through the point E, meeting BD in F; or which is the ſame, make each of the lines EG, HF, equal to the diſtance EH; then the lines joining the points A, E, F, G, H, B, will be the principal or outline of the front.

If the ſame conſtruction be performed on the other ſides of the polygon, you will have the principal or outline of the whole fortification.

If, with a radius of 20 toiſes, there be deſcribed circular arcs, from the angular points B, A, M, T, and lines are drawn from the oppoſite angles, E, H, &c. ſo as to touch theſe arcs, their parts, *a b*, *b c*, &c. together with theſe arcs, will repreſent the outline of the ditch.

Definitions.

1. The part FEALN, is called the baſtion.
2. AE, AL, the faces of the baſtion.
3. EF, LN, the flanks.
4. FG, the curtain.
5. FN, the gorge of the baſtion.
6. AG, BF, the lines of defence.
7. AB, the exterior ſide of the polygon.
8. CD, the perpendicular.
9. Any line which divides a work into two equal parts, is called the capital of that work.
10. *a b c*, the counterſcarp of the ditch.
11. A, M, the flanked angles.
12. H, E, L, the angles of the ſhoulder, or ſhoulder only.
13. G, F, N, the angles of the flank.
14. Any angle whoſe point turns from the place is called a *ſalient angle*, ſuch as A, M; and any angle whoſe

Of Orillons. Plate CCXXI.

whoſe point turns towards the place, a *re-entering angle*, ſuch as *b*, F, N.

15. If there be drawn two lines parallel to the principal or outline, the one at 3 toiſes diſtance, and the other at 8 from it; then the ſpace *y x* included between the principal one and that fartheſt diſtant, is called the *rampart*.

And the ſpace *x x*, contained by the principal line, and that near to it, and which is generally ſtained black, is called the *parapet*.

16. There is a fine line drawn within four feet of the parapet, which expreſſes a ſtep called *banquette*.

N. B. All works have a parapet of three toiſes thick, and a rampart of 8 to 10, beſides their ſlopes. The rampart is elevated more or leſs above the level of the place from 10 to 20 feet, according to the nature of the ground and the particular conſtructions of engineers.

Of Ramparts. Plate CCXXI.

The parapet is a part of the rampart elevated from 6 to $7\frac{1}{2}$ feet above the reſt, in order to cover the troops which are drawn up there from the fire of the enemy in a ſiege; and the banquette is two or three feet higher than the rampart, or about four feet lower than the parapet; ſo that when the troops ſtand upon it they may juſt be able to fire over the parapet.

17. The body of the place, is all that which is contained within this firſt rampart: for which reaſon it is often ſaid to conſtruct the body of the place; which means properly, the conſtruction of the baſtions and curtains.

18. All the works which are conſtructed beyond the ditch before the body of the place are called *outworks*.

TABLE.

	Forts.						Little Fortif.				Mean.			
Side of Polyg.	80	90	100	110	120	130	140	150	160	170	180	190	200	260
Perpendicul.	10	11	$12\frac{1}{2}$	14	15	16	20	21	23	25	30	31	25	22
Faces baſt.	22	25	28	30	33	35	40	42	45	47	50	53	55	60
Cape of ravel.	25	28	30	35	38	40	54	50	50	52	55	55	60	

In the firſt vertical column are the numbers expreſſing the lengths of the exterior ſides from 80 to 260. In the ſecond, the perpendiculars anſwering to theſe ſides. In the third, the lengths of the faces of baſtions: and in the fourth, the lengths of the capitals of the ravelins.

The forts are moſtly, if not always, ſquares: for which reaſon, the perpendiculars are made one-eighth of the exterior ſides; becauſe if they were more, the gorges of the baſtions would become too narrow.

The little fortification is chiefly deſigned for citadels, and are commonly pentagons; the perpendiculars are made one-ſeventh of the exterior ſide: the mean is uſed in all kinds of fortifications from an hexagon upwards to any number of ſides; and the great is ſeldom uſed but in an irregular fortification, where there are ſome ſides that cannot be made leſs without much expence or in a town which lies near a great river, where the ſide next the river is made from 200 to 260 toiſes; and as that ſide is leſs expoſed to be attacked than any other, the perpendicular is made ſhorter, which ſaves much expence.

The faces of the baſtions are all $\frac{2}{7}$ths of the exterior ſides, or nearly ſo, becauſe the fractions are neglected.

It may be obſerved in general, that in all ſquares the perpendicular is $\frac{1}{8}$th of the exterior ſide, and all pentagons $\frac{1}{7}$th, and in all the reſt upward $\frac{1}{6}$th.

1. *Conſtruction of Orillons and retired Flanks.*

Deſcribe the front MPQRST as before, and divide the flank into three equal parts, of which ſuppoſe S *r* to be one: from the oppoſite flanked angle M draw a line M *r*, in which take the part *m r* of 5 toiſes; take likewiſe R *n* in the line of defence MR, produced, equal to 5 toiſes, and join *n m*, upon which as a baſe deſcribe the equilateral triangle *n p m*, and from the angle *p*, oppoſite to the baſe as centre, is deſcribed the circular flank *n m*.

And if S *r* be biſected by the perpendicular 1, 2, and another be erected upon the face ST, at S; the interſection 2 of theſe two perpendiculars will be the centre of the arc which forms the orillon.

The orillons are very uſeful in covering the retired flanks, which cannot be ſeen but directly in the front; and as theſe orillons are round, they cannot be ſo eaſily deſtroyed as they would be if they were of any other figure.

2. *Conſtruction of Ravelins or Half-moons.*

Fig. 2. Set off 55 toiſes, from the re-entering angle O of the counterſcarp, on the capital OL or on the perpendicular produced, and from the point L draw lines to the ſhoulders AB; whoſe parts LM, LN, terminated by the counterſcarp, will be the faces, and MO, ON, the ſemi-gorges, of the ravelin required. Fig. 2.

This is M. Vauban's method of conſtructing ravelins, according to ſome authors: and others will have the faces of the ravelin to terminate on thoſe of the baſtions within 3 toiſes of the ſhoulders; which ſeems to be the beſt way, for theſe ravelins cover the flanks much better than the others.

The ditch before the ravelin is 12 toiſes, its counterſcarp parallel to the faces of the ravelins; and it is made in a circular arc, before the ſalient angle; as likewiſe all ditches are in general.

When the ravelins are made with flanks, as in fig. 3. the faces ſhould terminate on thoſe of the baſtions, at leaſt 5 toiſes from the ſhoulders. Fig. 3.

The flanks are made by ſetting off 10 toiſes from the extremities of the faces, from *f* to *h*, and from *m* to *l*; and from the points *h*, *l*, the flanks *h*, *k*, *l*, *p*, are drawn parallel to the capital LO of the ravelin.

Of Tenailles. Plate CCXXI.

There are ſometimes redoubts made in the ravelin, ſuch as in fig. 2. which is done by ſetting off 16 toiſes from the extremities of the faces on the ſemi-gorges from N to *b*, and from M to *a*; and from the points *b*, *a*, the faces are drawn parallel to thoſe of the ravelin: the ditch before the redoubt is 6 toiſes, and its counterſcarp parallel to the faces.

3. *Conſtruction of Tenailles.*

A tenaille is a work made in the ditch before the curtains, the parapet of which is only 2 or 3 feet higher than the level ground of the ravelin. There
Fig. 4. are three different ſorts: the firſt are thoſe as in fig. 4. which are made in the direction of the lines of defence, leaving a paſſage of 3 toiſes between their extremities and the flanks of the baſtions, as likewiſe another of 2 in the middle for a bridge of communication to the ravelin.

Fig. 5. The ſecond ſort are thoſe as in fig. 5. Their faces are in the lines of defence, and 16 toiſes long, beſides the paſſage of 3 toiſes between them and the flanks of the baſtions; their flanks are found by deſcribing arcs from one ſhoulder of the tenaille as centre through the other, on which are ſet off 10 toiſes for the flanks deſired.

Fig. 6. And the third ſort are thoſe as in fig. 6. Their faces are 16 toiſes, as in the ſecond ſort, and the flanks are parallel to thoſe of the baſtions.

The uſe in general of tenailles is to defend the bottom of the ditch by a grazing fire, as likewiſe the level ground of the ravelin, and eſpecially the ditch before the redoubt within the ravelin, which can be defended from nowhere elſe ſo well as from them.

The firſt ſort do not defend the ditch ſo well as the others, as being too oblique a defence; but as they are not ſubject to be enfiladed, M. Vauban has generally preferred them in the fortifying of places, as may be ſeen in the citadel of Lille, at Landau, New Briſac, and in a great many other places.

The ſecond ſort defend the ditch much better than the firſt, and add a low flank to thoſe of the baſtion: but as theſe flanks are liable to be enfiladed, they have not been much put in practice. This defect might however be remedied, by making them ſo as to be covered by the extremities of the parapets of the oppoſite ravelins, or by ſome other work.

As to the third ſort, they have the ſame advantage as the ſecond, and are likewiſe liable to the ſame objections; for which reaſon, they may be uſed with the ſame precautions which have been mentioned in the ſecond.

Tenailles are eſteemed ſo neceſſary, that there is hardly any place fortified without them: and it is not without reaſon. For when the ditch is dry, the part behind the tenailles ſerves as a place of arms, from which the troops may ſally, deſtroy the works of the enemy in the ditch, oppoſe their deſcent, and retire with ſafety; and the communication from the body of the place to the ravelin becomes eaſy and ſecure: which is a great advantage; for by that means the ravelin may be a much better defence, as it can be ſupplied with troops and neceſſaries at any time. And if the ditch is wet, they ſerve as harbours for boats, which may carry out armed men to oppoſe the paſſage over the ditch whenever they pleaſe; and the communication from the tenailles to the ravelin becomes likewiſe much eaſier than it would be without them.

Of Lunettes, &c. Plate CCXXI.

4. *Conſtruction of Lunettes.*

Fig. 7. Lunettes are placed on both ſides of the ra- Fig. 7.
velin, ſuch as B, to increaſe the ſtrength of a place: they are conſtructed, by biſecting the faces of the ravelin with the perpendicular LN; on which is ſet off 30 toiſes from the counterſcarp of the ditch, for one of its faces; the other face, PN, is found by making the ſemi-gorge TP of 25 toiſes; the ditch before the lunettes is 12 toiſes, the parapet 3, and the rampart 8, as in the ravelin.

There is ſometimes another work made to cover the ſalient angle of the ravelin, ſuch as A, called *bonnet*, whoſe faces are parallel to thoſe of the ravelin, and when produced biſect thoſe of the lunettes; the ditch before it is 10 toiſes.

There are likewiſe lunettes, ſuch as D in fig. 8. Fig. 8.
whoſe faces are drawn perpendicular to thoſe of the ravelin, within a third part from the ſalient angle; and their ſemi-gorges are only 20 toiſes.

Theſe kinds of works may make a good defence, and coſt no very great expence; for as they are ſo near the ravelin, the communication with it is very eaſy, and one cannot well be maintained till they are all three taken.

5. *Conſtruction of Tenaillons.*

Fig. 9. Produce the faces of the ravelin beyond the Fig. 9.
counterſcarp of the ditch, at a diſtance MN of 30 toiſes, and take on the counterſcarp of the great ditch 15 toiſes from the re-entering angle *p* to *q*, and draw N *q*; then *q* NM *p* will be the tenailles required; its ditch is 12 toiſes, that is, the ſame as that of the ravelin. Sometimes there is made a retired battery in the front of the tenaillons, as in B; this battery is 10 toiſes from the front to which it is parallel, and 15 toiſes long.

There are commonly retrenchments made in the tenaillons, ſuch as O; their parapets are parallel to the fronts MN, and biſect the ſide *q* N; the ditch before this retrenchment is 3 toiſes; and there is a banquette before the parapet next to the ditch of about 8 feet, called *berm*; which ſerves to prevent the earth of the parapet (which ſeldom has any revetment) from falling into the ditch.

It is to be obſerved, that the ravelin, before which tenaillons are conſtructed, muſt have its ſalient angles much greater than the former conſtruction makes them; otherwiſe the ſalient angles of the tenaillons become too acute; for which reaſon we made the capital of this ravelin 45 toiſes, and the faces terminate within 3 toiſes of the ſhoulders.

6. *Conſtruction of Counterguards.*

Fig. 10, 11. When the counterguard is placed be- Fig. 10.
fore the ravelin, ſet off 40 toiſes on the capital of the and 11.
ravelin from the ſalient angle A to the ſalient angle B, of the counterguard; and 10 from C to D, on the counterſcarp of the ditch.

When the counterguard is before the baſtion, ſuch as

Of Hornworks, &c. Plate CCXXI.

in fig. 2. its ſalient angle F is 50 toiſes from the ſalient angle E of the baſtion, and the breadth near the ditch of the ravelin 10 toiſes as before.

The ditch before the counterguards is 12 toiſes, and its counterſcarp parallel to the faces.

Counterguards are made before the ravelin on ſome particular occaſions only; but are frequently conſtructed before the baſtions, as covering the flanks wonderfully well. Some authors, as Mr Blondel and Mr Coehorn, will have them much narrower than they are here.

7. *Conſtruction of Hornworks.*

Fig. 12. Fig. 12. Produce the capital of the ravelin beyond the ſalient angle A, at a diſtance AB of about 80 toiſes; draw DBE at right angles to AB; in which take BD, BE, each equal to 55 toiſes; and on the exterior ſide DE, trace a front of a polygon in the ſame manner as that of the body of the place, making the perpendicular BF 10 toiſes, and the faces 30.

The branches D *a*, E *b*, of the hornwork, when produced, terminate on the faces of the baſtions, within 5 toiſes of the ſhoulders. The ditch of the hornwork is 12 toiſes, and its counterſcarp parallel to the branches; and in the front terminates at the ſhoulders, in the ſame manner as the great ditch before the baſtions.

The capital of the ravelin before the front of the hornwork is 35 toiſes, and the faces terminate on the ſhoulders, or rather 2 or 3 toiſes beyond them: and the ditch before the ravelin is 8 toiſes.

There are ſometimes retrenchments made within the hornwork, ſuch as S, S; which are conſtructed by erecting perpendiculars to the faces of the ravelins, within 25 toiſes of their extremities. This retrenchment, like all others, has a parapet turfed only with a berm of 8 feet before it; as likewiſe a ditch from 3 to 5 toiſes broad.

Fig. 13. Fig. 13. When a hornwork is made before the baſtion, the diſtance DL of the front from the ſalient angle of the baſtion is 100 toiſes, and the branches terminate on the faces of the adjacent ravelins within 5 toiſes from their extremities; all the reſt is the ſame as before.

8. *Conſtruction of Crownworks.*

Plate CCXXII. fig. 14. From the ſalient angle, A (fig. 14.) of the ravelin, as a centre, deſcribe an arc of a circle with a radius of about 120 toiſes, cutting the capital of the ravelin produced at C; from the point C, ſet off the cords CB, CF, each of them equal to 110 toiſes; and on each of which, as an exterior ſide, conſtruct a front of a polygon of the ſame dimenſions as in the hornwork; that is, the perpendicular ſhould be 18 toiſes, the faces 30, and the branches terminate on the faces of the baſtions within 25 toiſes of the ſhoulders.

The ditch is 12 toiſes, the capital of the ravelin 35, and its ditch 8; that is, the ſame as in the hornwork.

Fig. 15. Sometimes the crownwork is made before the baſtion, as in fig. 15. The arc is deſcribed from the ſalient angle A of the baſtion, with a radius of 120 toiſes, as before; and the branches terminate on the faces of the adjacent ravelins within 25 toiſes of their extremities; the reſt of the dimenſions and conſtructions are the ſame as before.

Of Covert-ways, &c. Plate CCXXII.

Hornworks, as well as crownworks, are never made but when a large ſpot of ground falls beyond the fortification, which might be advantageous to an enemy in a ſiege, or to cover ſome gate or entrance into a town.

9. *Conſtruction of Covert-ways and Glacis.*

Although we have not hitherto mentioned the covert-way, nevertheleſs all fortifications whatſoever have one; for they are eſteemed to be one of the moſt eſſential parts of a modern fortification; and it is certain, the taking the covert-way, when it is in a good condition and well defended, is generally the moſt bloody action of the ſiege.

After having conſtructed the body of the place, and all the outworks which are thought neceſſary, lines are drawn parallel to the outmoſt counterſcarp of the ditches, at 6 toiſes diſtant from it; and the face *mn*, *mn*, included between that line and the counterſcarp, will be the covert-way required.

Fig. 16. There is in every re-entering angle of the counterſcarp a place of arms *m*; which is found by ſetting off 20 toiſes from the re-entering angle *a*, on both ſides from *a* to *b*, and from *a* to *c*; and from the points *b*, *c*, as centres, arcs are deſcribed with a radius of 25 toiſes, ſo as to interſect each other in *d*; then the lines drawn from this interſection to the points *b*, *c*, will be the faces of the places of arms. Fig. 16.

If lines are drawn parallel to the lines which terminate the covert-way, and the places of arms at 20 toiſes diſtant from them, the ſpace *x*, *x*, *x*, between theſe lines and thoſe which terminate the covert-way will be the glacis.

At the extremities of the places of arms, are traverſes made, ſuch as *v*, *v*, which ſerve to encloſe them; theſe traverſes are 3 toiſes thick, and as long as the covert-way is broad; and a paſſage is cut in the glacis round them, of about 6 or 8 feet, in order to have a free communication with the reſt of the covert-way.

There are alſo traverſes of the ſame dimenſions before every ſalient angle of the baſtion and outworks, and are in the ſame direction as the faces of thoſe works produced; and the thickneſs lies at the ſame ſide as the parapets.

The paſſages round theſe laſt traverſes are likewiſe from 6 to 8 feet wide.

In each place of arms are two ſally ports *z z*, which are 10 or 12 feet wide, for the troops to ſally out; in time of a ſiege they are ſhut up with barriers or gates.

10. *Conſtruction of Arrows and Detached Redoubts.*

An arrow is a work made before the ſalient angles of the glacis, ſuch as A, fig. 16. It is compoſed of a parapet of 3 toiſes thick, and 40 long; and the ditch before it 5 toiſes, terminating in a ſlope at both ends. The communication from the covert-way into theſe arrows is 4 or 5 toiſes wide; and there is a traverſe, *r*, at the entrance, of 3 toiſes thick, with a paſſage of 6 or 8 feet round it.

A detached redoubt is a kind of work much like a ravelin, with flanks placed beyond the glacis; ſuch as B: they are made in order to occupy ſome ſpot of ground

Of Covert-ways, &c.

ground which might be advantageous to the beſiegers; likewiſe to oblige the enemy to open their trenches farther off than they would do otherwiſe.

Plate CCXXII.

Their diſtance from the covert-way ought not to exceed 120 toiſes, that it may be defended by muſket ſhot from thence.

The gorge *a b* is 40 toiſes; the flanks *a c*, *b f*, which are perpendicular to the gorge, 10; and the faces *c d*, *f d*, 30: the ditch before it is 6 toiſes, ending in ſlopes at both ends; the covert-way 4; the branches of the covert-way are 42 toiſes long, or thereabouts; the faces of the places of arms *y*, *y*, which are perpendicular to the branches, 10; and the other, which is parallel to them, 14.

The communication from the covert-way into the redoubt, is 5 or 6 toiſes wide; and there is a traverſe made juſt at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a ſlope or glacis.

If theſe redoubts are above 50 toiſes diſtant from the covert-way, the beſiegers carry their trenches round, and enter through the gorge; by which the troops that are in them are made priſoners of war, if they do not retire betimes; to prevent which, ſome other outworks ſhould be made to ſupport them.

11. *Conſtruction of Second Ditches and Covert-ways.*

Fig. 17.

Fig. 17. When the ground is low, and water to be found, there is often a ditch about 10 or 12 toiſes made round the glacis; and oppoſite to the places of arms are conſtructed lunettes, beyond the ditch: ſuch as D, whoſe breadth on the counterſcarp of the ditch is 10 toiſes, from *b* to *a*, and from *c* to *d*; and the faces *a* L, *d* L, are parallel to thoſe of the places of arms; the ditch before them is from 8 to 10 toiſes wide.

The ſecond covert-way is 4 toiſes, the ſemi-gorges of the places of arms, *m*, about 15, and the faces perpendicular to the counterſcarp; the ſecond glacis is from 15 to 18 toiſes broad.

This ſecond covert-way has traverſes everywhere, in the ſame manner as the firſt.

12. *Conſtruction of Profiles.*

A profile is the repreſentation of a vertical ſection of a work; it ſerves to ſhow thoſe dimenſions which cannot be repreſented in plans, and is neceſſary in the building of a fortification. Profiles are generally conſtructed upon a ſcale of 30 feet to an inch. It would be endleſs to deſcribe all their particular dimenſions; we ſhall therefore lay down the principal rules only, given by M. Vauban, on this ſubject.

1. Every work ought to be at leaſt 6 feet higher than that before it, ſo that it may command thoſe before it: that is, that the garriſon may fire from all the works at the ſame time, with great and ſmall arms, at the beſiegers in their approaches. Notwithſtanding this ſpecious pretence, there are ſeveral authors who object againſt it. For, ſay they, if you can diſcover the enemy from all the works, they can diſcover, by the ſame reaſon, all the works from their batteries; ſo that they may deſtroy them without being obliged to change their ſituation, and thereby diſmount all the guns of the place before they come near it.

But if all the works were of the ſame height, thoſe within cannot be deſtroyed, till ſuch time as thoſe before them are taken: guns might be placed in the covert-way and outworks to obſtruct the enemy's approach; and when they come near the place, they might be tranſported into the inner works: and as the body of the place would be much lower, the expence would be conſiderably diminiſhed.

Of Profiles.

Plate CCXXII.

But when works are low, they are eaſily enfiladed by the ricochet batteries, which is a kind of firing with a ſmall quantity of powder, by giving the gun an elevation of 10 or 12 degrees: this might however be partly prevented, by making the parapets near the ſalient angles, for the ſpace of 8 toiſes on each ſide, 5 or 6 feet higher than the reſt of the works.

2. The covert-way ſhould be lower than the level ground, otherwiſe the body of the place muſt be raiſed very high, eſpecially where there are ſeveral outworks: this is to be underſtood only when the works exceed each other in height, otherwiſe it need not be below the level.

3. The baſes of all inward ſlopes of earth ſhould be at leaſt equal to the height, if not more.

4. The baſes of all outward ſlopes of earth, two-thirds of their heights.

5. The ſlopes of all walls, or revetments, ſhould be one-fifth of their height; or one-ſixth might perhaps be ſufficient: the height of a wall is eſtimated from the bottom of the ditch, and not from the beginning of its foundation.

6. The ſlopes of all parapets and traverſes are one-ſixth of their breadth; that is, 3 feet towards the field; or the inſide, where the banquettes ſhould be 3 feet higher than the outſide.

7. When the revetment of a rampart goes quite up to the top, 4 feet of the upper part is a vertical wall of 3 feet thick, with a ſquare ſtone at the top of it projecting 6 inches; and a circular one below, or where the ſlope begins, of 8 or 10 inches diameter: they go quite round the rampart, and the circular projection is called the *cordon*.

Where the ſtraight part of the wall ends and the ſlope begins, the wall is always made 5 feet thick; and the counterforts or buttreſſes reach no higher than that place.

8. When the rampart is partly walled and partly turfed, then one-fifth of the height which is turfed muſt be added to 5 feet, to get the thickneſs of the wall above.

And having the thickneſs of any wall above, by adding one-fifth of its height from the bottom of the ditch, the ſum will be the thickneſs of the wall at the bottom; but if a ſixth part is only taken for the ſlope, then a ſixth part muſt be added.

For inſtance, ſuppoſe a rampart of 30 feet high from the bottom of the ditch, and that 10 of which are to be turfed; then the fifth part of 10, which is 2, added to 5, gives 7 for the wall above; and as this wall is 20 feet high, the fifth of which is 4, and 4 added to the thickneſs 7 above, gives 11 for the thickneſs near the foundation.

Plate CCXXIII. fig. 18.

Fig. 18. Repreſents (in military perſpective) the profiles of the body of a place, the ravelin, and covert-way; which gives a clear idea of what is meant by a profile, and from which thoſe of all other works may be eaſily conceived.

Sect.

Of Irregular Fortification.

Plate CCXXIII.

Sect. II. *Of Irregular Fortification.*

The moſt eſſential principle in fortification conſiſts in making all the fronts of a place equally ſtrong, ſo that the enemy may find no advantage in attacking either of the ſides. This can happen no otherwiſe in a regular fortification ſituated in a plain or even ground: but as there are but few places which are not irregular either in their works or ſituations, and the nature of the ground may be ſuch as makes it impracticable to build them regular without too great expence; it is ſo much the more neceſſary to ſhow in what conſiſts the ſtrength or weakneſs of a town irregularly fortified, ſo that the weakeſt part may be made ſtronger by additional outworks; as likewiſe, if ſuch a place is to be attacked, to know which is the ſtrongeſt or weakeſt part.

1. *Conſtruction of an Irregular Place ſituated in an open country.*

If the place to be fortified is an old town encloſed by a wall or rampart, as it moſt frequently happens, the engineer is to conſider well all the different circumſtances of the figure, ſituation, and nature of the ground; and to regulate his plan accordingly, ſo as to avoid the diſadvantages, and gain all the advantages poſſible: he ſhould examine, whether by cutting off ſome parts of the old wall or rampart, and taking in ſome ground, the place can be reduced into a regular figure, or nearly ſo; for if that can be done without increaſing the expence conſiderably, it ſhould by no means be omitted. Old towns have often towers placed from diſtance to diſtance, as Douay, Tournay, and many other places, which are generally made uſe of, and mended when it may be done. If there is a rampart without baſtions or towers, it muſt be well conſidered whether baſtions may not be added, or if it is not better to make only ſome outworks: if the ditch about this rampart is not too wide and deep, it would be advantageous to make detached baſtions; otherwiſe ravelins and counterguards muſt be conſtructed. Special care muſt be taken to make all the ſides of the polygon as nearly equal as poſſible, and that the length of the lines of defence do not exceed the reach of muſket-ſhot; but if that cannot be done, thoſe ſides which are on the narroweſt part ſhould be made the longeſt.

If it ſhould happen that ſome of the ſides are inacceſſible or of very difficult approach, either on account of ſome precipice, marſhy ground, or inundation, they may be made much longer than the others which are of eaſy acceſs, and the flanks need not be ſo large as the reſt; by doing ſo, there will be ſome expences ſaved, which may be uſed in making the other ſides ſtronger by adding more outworks.

There are few ſituations but what are more advantageous in ſome parts than in others; it is therefore the buſineſs of an engineer to diſtinguiſh them, and to render thoſe ſides ſtrong by art which are not ſo by nature.

If the ſituation is low and watery, lunettes or tenaillons, and ſuch other ſmall outworks, ſhould be conſtructed; becauſe they are not of any great expence, and may make a very good defence. But if one ſide of the place only is low, and running water is to be had, a ſecond ditch and covert-way with lunettes may be made, by obſerving, that if the firſt glacis is made to ſlope, ſo as to become even with the level of the water in the ſecond ditch; or if the water can be ſwelled by means of dikes or ſluices, ſo as to overflow the beſt part of the firſt glacis, it ſhould be done: for by ſo doing theſe works will be able to make a very good defence, ſince the beſiegers will find it a difficult matter to lodge themſelves upon this glacis; which cannot be done but within a few toiſes of the firſt covert-way, where the beſieged are ready to receive them, and to deſtroy their works with great advantage; whereas the enemy cannot ſupport their workmen but from the ſecond covert-way, which is too far off to be of any great ſervice to them.

Of Irregular Fortification.

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But if the ſituation is of a dry nature, without any water upon it, caponiers ſhould be made in the great ditch, from the curtains to the ravelin, and batteries raiſed in the entrance of the ditch before the ravelin, whoſe parapet muſt ſlope off into a glacis ſo as to afford no cover for the enemy behind them. Arrows and detached redoubts are likewiſe very proper to be uſed in ſuch a caſe; and ſometimes horn or crownworks, if it ſhould be thought convenient: but theſe works ſhould never be conſtructed without an abſolute neceſſity, either to occupy a ſpot of ground which might be advantageous to the enemy, or to cover ſome gate or entrance into the town; for they are of great expence, and their defence ſeems not to be anſwerable to it.

Moſt of the places in Flanders are fortified with hornworks, ſuch as Ypres, Tournay, Liſle, and others.

If the place to be fortified is new, and the ſituation will not admit of a regular conſtruction, particular care muſt be taken in chooſing ſuch a ſpot of ground as is moſt advantageous, and leaſt liable to any diſadvantages either in the building or in the maintaining of it. All hills or riſing grounds ſhould be avoided, which might command any part of the works; marſhy grounds, becauſe ſuch ſituations are unwholeſome; or lakes and ſtanding waters for the ſame reaſon, excepting a lake is or may be made navigable. Good water ſhould be had either within the place or near it, for it is abſolutely neceſſary for men and cattle: the air ſhould be wholeſome; otherwiſe the continual ſickneſs that may reign in ſuch a place might prevent people to come and live in it, and the garriſon would not be in a condition to defend themſelves as they ought to do. In ſhort, all the different circumſtances attending ſuch an undertaking ſhould be maturely conſidered before a reſolution is taken to fortify any place.

When a ſituation is fixed upon, the next thing to be conſidered is the bigneſs of the town and the number of its outworks; which muſt abſolutely depend upon the conſequence ſuch a place is of to a nation. If it is only to guard a paſs or entrance into a country, it need not be ſo large: but if it is to be a place either to promote or to protect trade, it ſhould be large and commodious; the ſtreets ſhould be wide, and the buildings regular and convenient. As to what regards the fortification, its conſtruction ſhould depend on the nature of the ſituation, and the number of works, on the funds or expence a prince or a nation will be at; which, however, ought to be according to the benefit ariſing

from

Of Irregular Fortification.

Plate CCXXIII.

from ſuch a place; for as ſuch undertakings are of very great expence, an engineer cannot be too ſparing in his works; on the contrary, the greateſt economy ſhould be uſed both in regard to the number of works and to their conſtruction. The body of the place may have (A) revetments quite up to the top, or only in part and the reſt turfed; but as to the outworks, they ſhould have half revetments, or they may be made with turf only; as being not ſo neceſſary to prevent the place from being ſurpriſed, which may nevertheleſs make a good defence.

Fig. 19. Fig. 19. is the plan of an octagon, one half of which is ſimilar and equal to the other half; it being ſuppoſed, that the ſituation would not admit of a fortification quite regular. The exterior ſides are each 180 toiſes, and the works are conſtructed according to our method: but becauſe the ſides AB, EF, are weaker than the reſt, as has been proved before, we have added tenailles, redoubts in the ravelins, and lunettes, to render them nearly equal in ſtrength with the others; and if counterguards were made before the baſtions A and B, it would effectually ſecure that front. Inſtead of lunettes, any other works may be made, as may be thought convenient and according to the nature of the ground. If it ſhould be judged neceſſary to add other outworks to the ravelins all around the place, care muſt be taken to add likewiſe more to the fronts AB, EF, in order to render the advantages and diſadvantages of attacking on either ſide equal.

2. *Conſtruction of an Irregular Place ſituated on a hill or rock.*

In the conſtruction of ſuch places, care muſt be taken that no neighbouring hill commands any part of the works. The town ſhould always be built on the higheſt part; but if it ſhould be thought more convenient to place it lower, then the upper part muſt be fortified with a fort. The ſituation ſhould be made level as near as poſſible, by removing the earth from ſome places to fill up others; and if it cannot well be levelled without extraordinary expence, works muſt be made on the higheſt part, ſo as to command and protect the lower. The works ought to occupy all the upper part of the hill; but if it ſhould be too extenſive to be all encloſed, or ſo irregular as not to be fortified without great inconvenience, the parts which fall without ſhould be fortified with ſome detached works, and a communication with the place muſt be made either above or under ground. There ſhould be no cavity or hollow roads within cannon ſhot round about the place, where the enemy might be able to approach under cover. If there ſhould happen to be a ſpring near the top of the hill, it ſhould be encloſed in the fortification, or, if that cannot be done, by ſome work or other; for there is nothing more neceſſary, and at the ſame time ſcarcer, in ſuch ſituations, than water; for which reaſon there cannot be too much care in providing it: ſeveral ciſterns are to be made to receive the rain water, and to preſerve it; wells ſhould be dug likewiſe, though ever ſo deep, the water of which will ſerve for common uſe.

Of Irregular Fortification.

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Places built on hills or rocks ſhould never be large; for their uſe is generally to guard paſſes or inlets into a country, and are ſeldom uſeful in traffic; and it is a difficult matter to provide for a large garriſon in ſuch ſituations: neither ſhould any ſuch place be built without ſome very material reaſons; but when it is abſolutely neceſſary, great care and precaution ſhould be taken to render the works as perfect as the ſituation will admit of, and at the ſame time to be as frugal in the expence as poſſible.

3. *Conſtruction of Irregular Fortifications ſituated near rivers, lakes, or the ſea.*

As the intent of building theſe kind of places is chiefly to facilitate and protect trade, they are of more importance than any other kind, eſpecially in maritime countries, where the principal ſtrength and power depends on them: for which reaſon, we ſhall treat of this conſtruction more largely than of any other.

The firſt thing to be conſidered is their ſituation, which ought to be ſuch as to afford a good harbour for ſhipping, or a ſafe and eaſy entrance in ſtormy weather; but as it is hardly poſſible to find any where ſhips may go in and lie ſecure with all winds, care ſhould be taken to make them ſafe to enter with thoſe winds which are moſt dangerous; but it is not ſufficient that the harbour is ſafe againſt ſtormy weather, it ſhould likewiſe be ſo againſt an enemy both by land and water, for it often happens, that ſhips are deſtroyed where it was imagined they were ſecure, which is of too great conſequence not to be provided againſt; for which reaſon, forts or batteries muſt be built in the moſt convenient places, to prevent the enemy's ſhips from coming too near, ſo as to be able to cannonade thoſe in the harbour, or fling ſhells amongſt them; and if there is any danger of an enemy's approach by land, high ramparts and edifices muſt be built, ſo as to cover them.

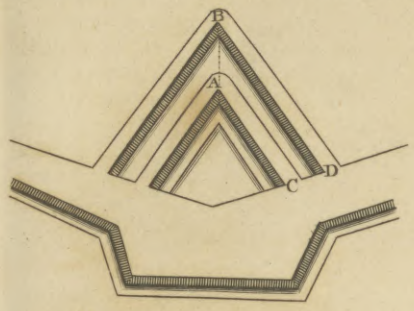
When a river is pretty large, and it is not convenient for making a harbour without great expence, the ſhips may ride along the ſhore: which for that reaſon, muſt be made acceſſible for ſhips of burden: this may be done by advancing the quay into the river if the water is too ſhallow, or by digging the river ſufficiently deep for that purpoſe.

And to prevent an enemy from coming up the river, forts muſt be built on both ſides, eſpecially when there are any turnings or windings. Antwerp is ſuch a place; for the Scheldt is ſufficiently deep to carry ſhips of great burden, which may come quite near the town-wall; and ſeveral forts are built below it on both ſides, ſo that it would not be an eaſy matter for an enemy to come up the river.

When the river is but ſmall, ſo that no ſhips of burden can come through it, it is ſufficient to make it run through ſome of the works, where proper landing-places are contrived, from whence the goods may be carried into

(A) Revetments are chiefly made to prevent a place from being ſurpriſed: outworks do not want to be made ſo; the taking them by ſurpriſe is of no great conſequence, except in a ſiege, when other precautions are uſed to prevent it.

Fig. 10.



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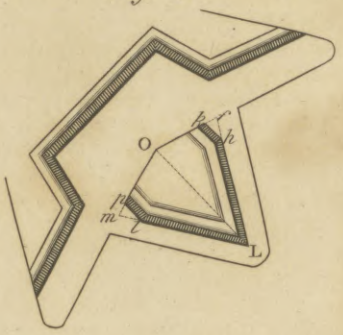

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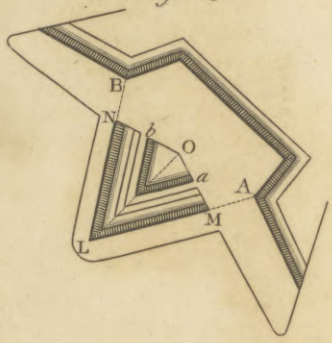

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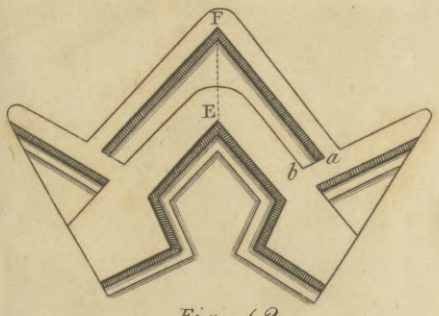


Fig. 1.

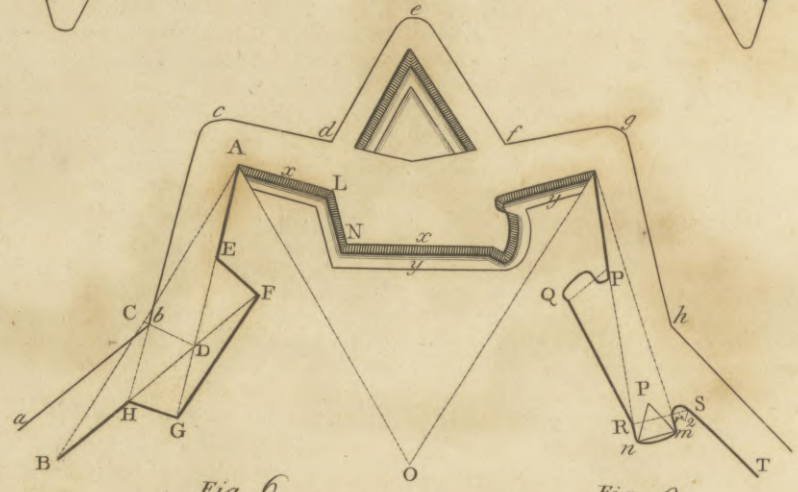


Fig. 12.

Fig. 6.

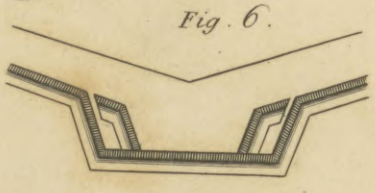


Fig. 9.

Fig. 7.

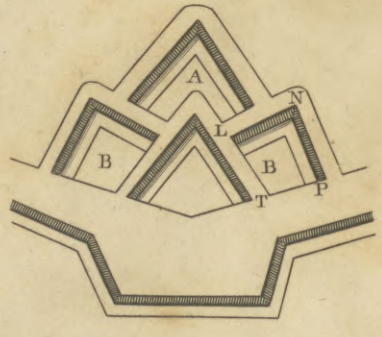


Fig. 13.

Fig. 8.

Fig. 4.

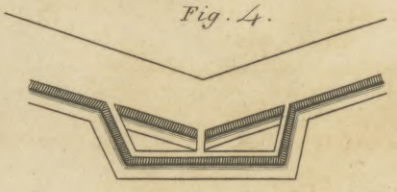
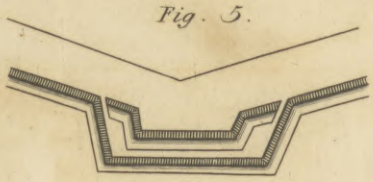


Fig. 5.



W. Archibald sc.

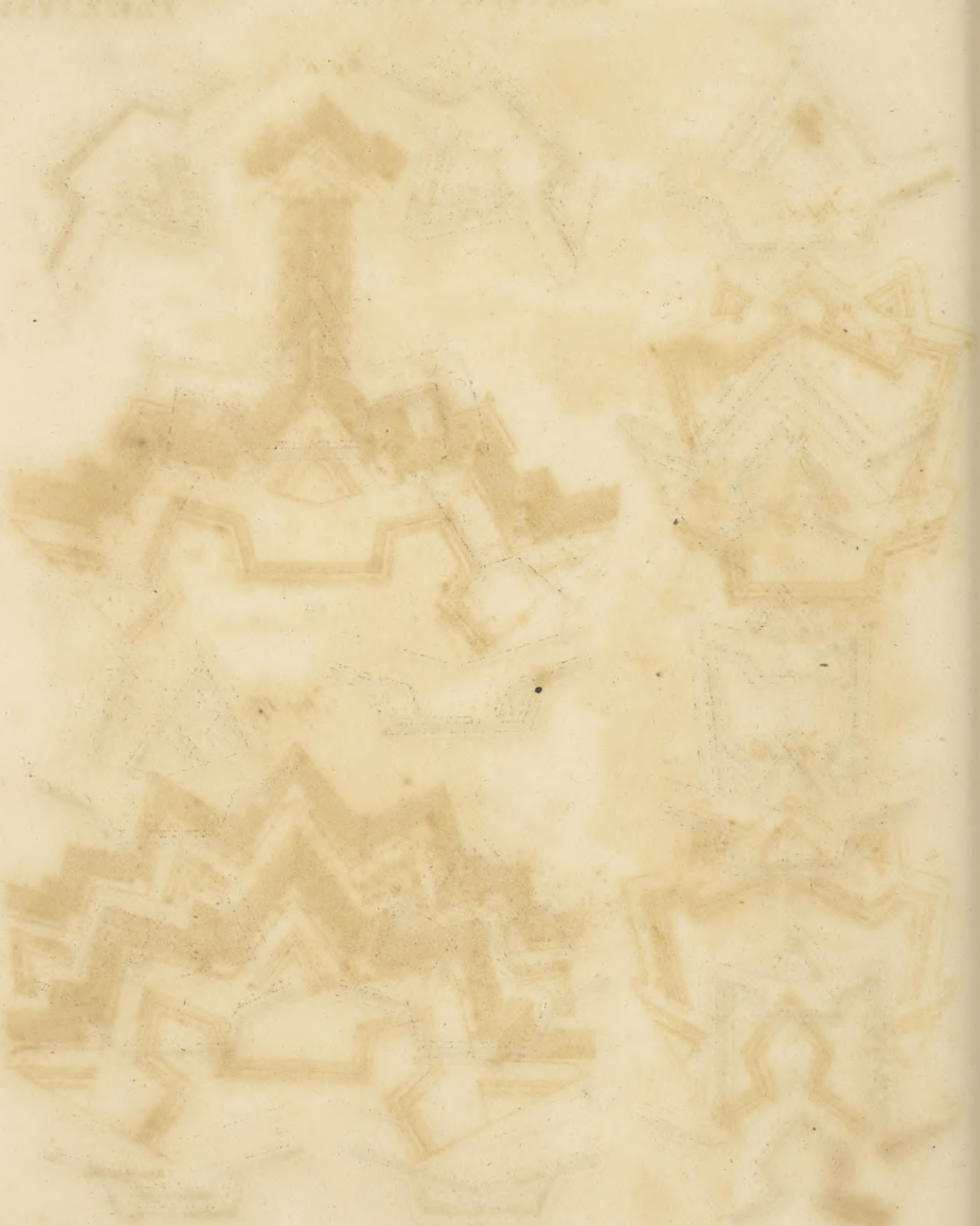


Fig. 16.

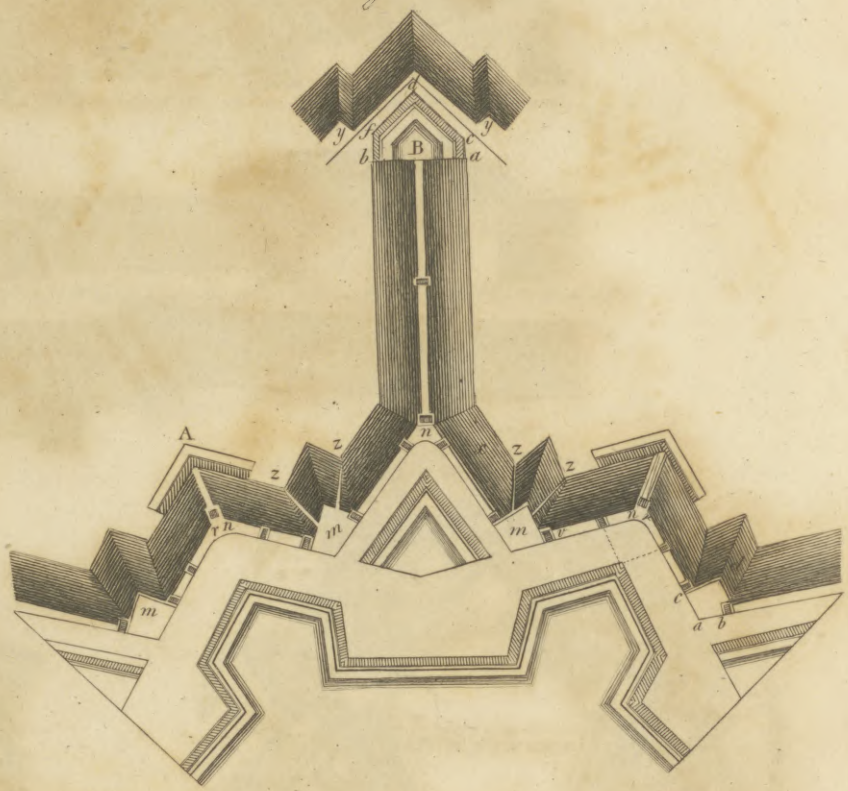


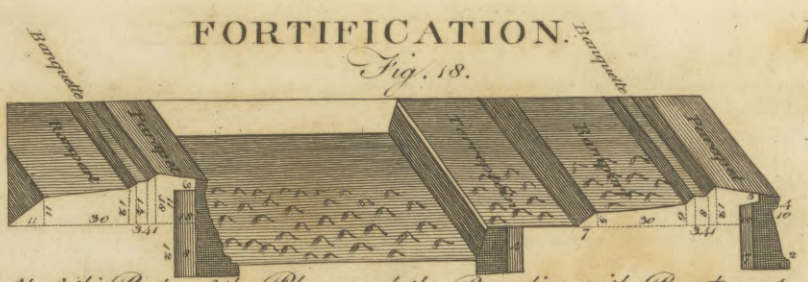
Fig. 14.

Fig. 17.

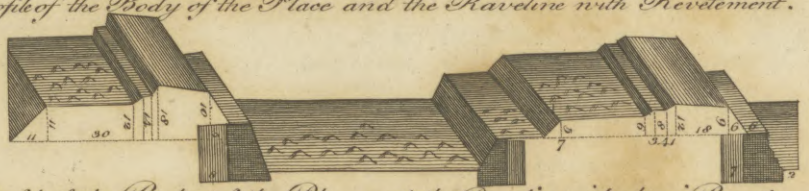
Fig. 15.

W. Archibald Sculp.

Fig. 18.



Profile of the Body of the Place and the Raveline with Revetement.



Profile of the Body of the Place and the Raveline with demi Revetement.

Fig. 19.

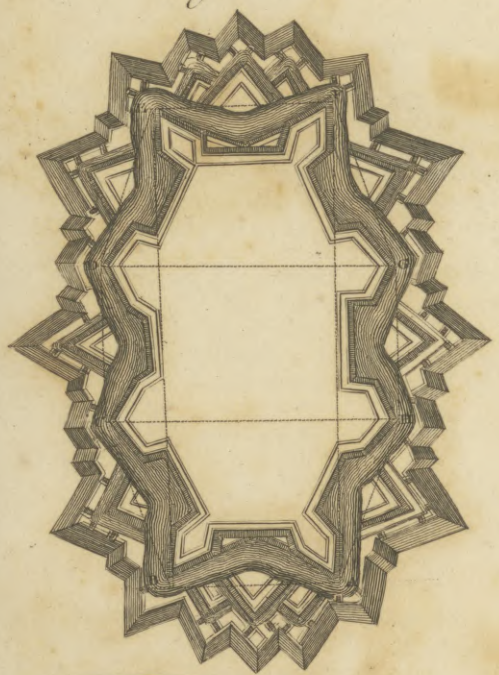
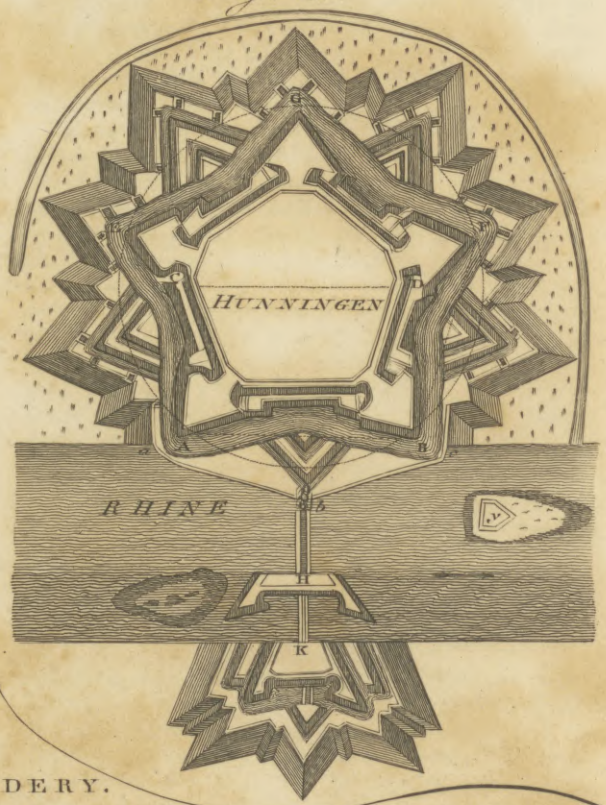


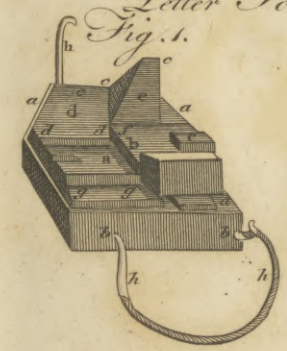
Fig. 20.



FOUNDERY.

Letter Foundery.

Fig. 1.



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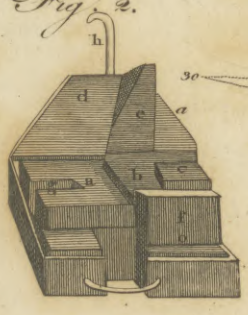
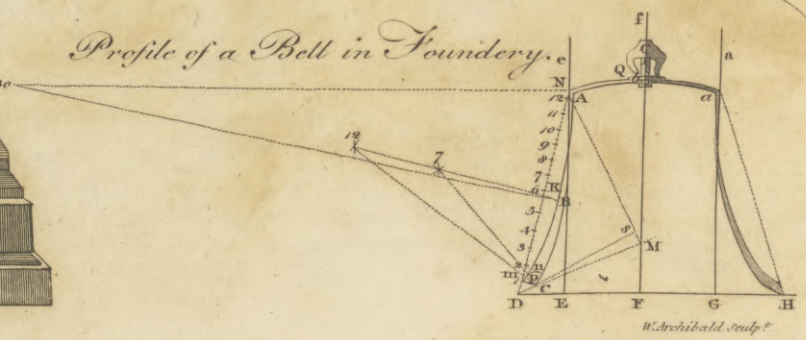
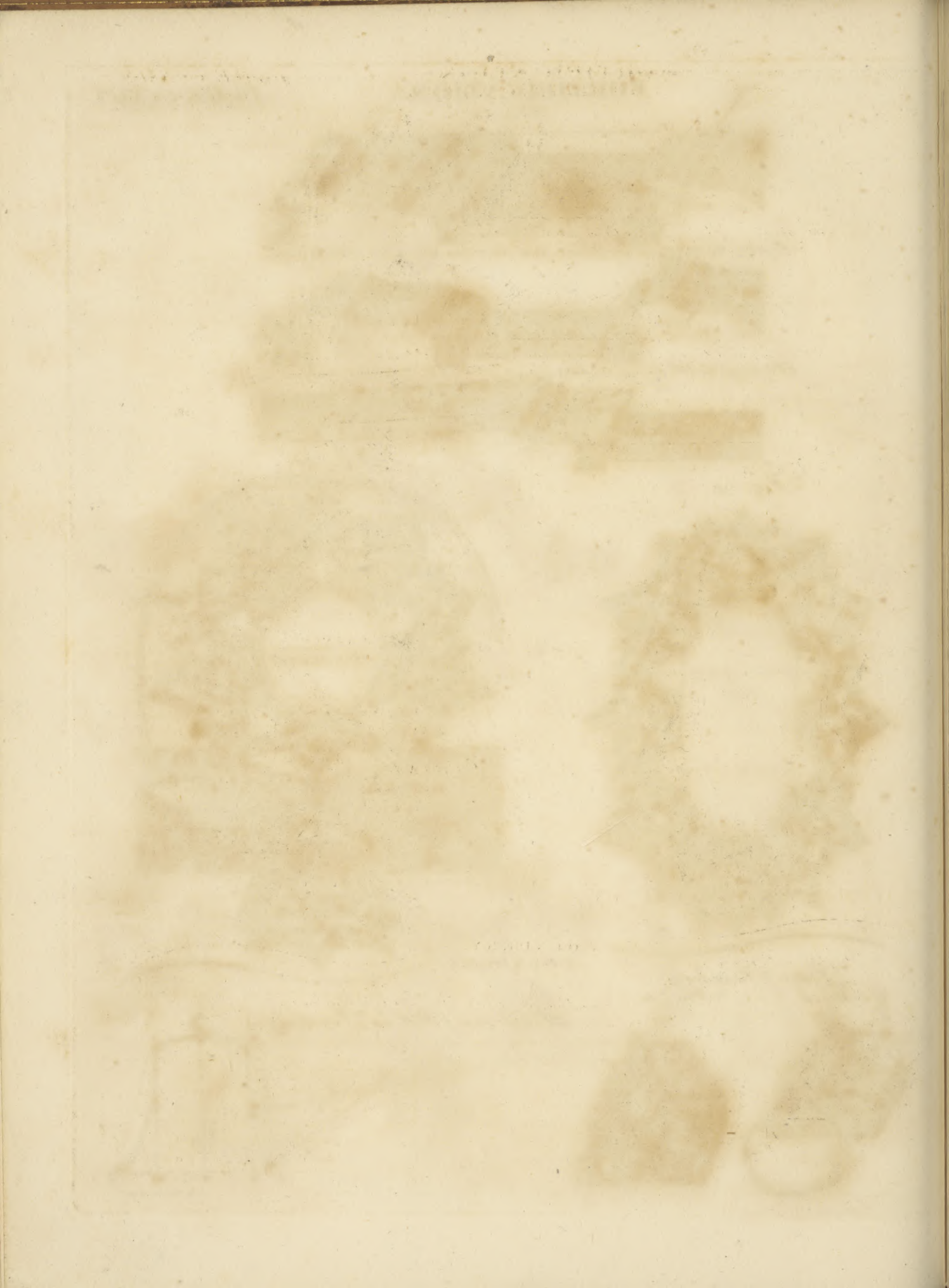


Profile of a Bell in Foundery.



W. Archibald Sculp.



Of Irregular Fortification.

into the place; as at Sarrelouis, where a hornwork is built beyond the Sarre, in the gorge of which the goods are landed.

Plate CCXXIII.

If the breadth of the river does not exceed 200 yards, it commonly paſſes through the middle of the town, and proper quays are made on each ſide; in ſuch a caſe, the fortification is ſo contrived, as that the river paſſes through the curtain, in order to have a baſtion on each ſide to defend the coming in and going out.

When M. Vauban fortified near rivers, he made always the exterior ſide near the water much longer than any of the others; ſuch as Hunninghen on the Rhine, and Sarrelouis on the Sarre; but for what reaſon he fortified theſe places in that manner, has not been told by any author.

But it is plain that the ſides which terminate at the river are the weakeſt; becauſe the beſiegers trenches being ſecured by the river, they may draw moſt of their troops off, and act therefore with more vigour and ſtrength on the other ſide: beſides, as the ſtrength of a ſide increaſes in proportion as the angle of the polygon is greater, by making the ſide next the river longer, the angles at the extremities become wider, and conſequently the adjacent ſides ſtronger.

There are other advantages, beſides thoſe mentioned already, which ariſe from the lengthening that ſide: for if the river is pretty deep, ſo as not to be fordable, that ſide is not liable to be attacked; and by increaſing its length, the capacity of the place increaſes much more in proportion to the expence, than if more ſides were made; the centre of the place will be likewiſe nearer the river, which makes it more convenient for tranſporting the goods from the water ſide to any part of the town.

Fig. 20.

To illuſtrate this method of M. Vauban's, we ſhall give the plan of Hunninghen: this place was built for the ſake of having a bridge over the Rhine, for which reaſon, he made it only a pentagon; the ſide AB next to the river is 200 toiſes, and each of the others but 180.

About the ſpace *a b c*, which lies before the front AB, is a ſtone wall; and the paſſages *x x* are ſhut up with ſluices, to retain the water in the ditches in dry ſeaſons: and to prevent an enemy from deſtroying the ſluice near the point *c*, whereby the water would run out and leave the ditches dry, the redoubt *y* was built in the little iſland hard by, in order to cover that ſluice; without which precaution the place might be inſulated from the river ſide, where the water is ſhallow in dry ſeaſons.

Of Irregular Fortification.

Plate CCXXIII.

The hornwork K beyond the Rhine was built to cover the bridge; but as this work cannot be well defended acroſs the river, the hornwork H was made to ſupport the other.

Before finiſhing the deſcription of this plan, we ſhall ſhow how to find the long ſide AB.

After having inſcribed the two ſides GE, GF, in a circle, draw the diameter CD, ſo as to be equally diſtant from the line joining the points EF that is parallel to it. On this diameter ſet off 100 toiſes on each ſide of the centre; from theſe points draw two indefinite perpendiculars to the diameter; then if from the points EF, as centres, two arcs are deſcribed with a radius of 180 toiſes, their interſections A and B, with the ſaid perpendiculars, will determine the long ſide AB, as likewiſe the other two FB and EA. In like manner may be found the long or ſhort ſide of any polygon whatſoever.

When a place near a river is to be fortified for the ſafety of commerce, particular care ſhould be taken in leaving a good ſpace between the houſes and the water ſide, to have a quay or landing place for goods brought by water; it ſhould alſo be contrived to have proper places for ſhips and boats to lie ſecure in ſtormy weather, and in time of a ſiege; and as water-carriage is very advantageous for tranſporting goods from one place to another, as likewiſe for bringing the neceſſary materials, not only for building the fortifications, but alſo the place itſelf, the expences will be leſſened conſiderably when this convenience can be had; for which reaſon, places ſhould never be built anywhere elſe but near rivers, lakes, or the ſea; excepting in extraordinary caſes, where it cannot be avoided.

FOR

Fortin || Fortitude.

FORTIN, FORTELER, or *Field-fort*, a ſconce, or little fort, whoſe flanked angles are generally 120 fathoms diſtant from one another.

The extent and figure of fortins are different, according to the ſituation and nature of the ground; ſome of them having whole baſtions, and others demi-baſtions. They are made uſe of only for a time, either to defend the lines of circumvallation, or to guard ſome paſſage or dangerous poſt.

FORTISSIMO, in *Muſic*, ſometimes denoted by FFF, or *fff*, ſignifies, to ſing or play very loud or ſtrong.

FORTITUDE, a virtue or quality of the mind, generally conſidered as the ſame with COURAGE; though in a more accurate ſenſe they ſeem to be diſtinguiſhable. Courage may be a virtue or a vice, according to

FOR

circumſtances; *fortitude* is always a virtue: we ſpeak of deſperate courage, but not of deſperate fortitude. A contempt or neglect of danger, without regard to conſequences, may be called *courage;* and this ſome brutes have as well as we: in them it is the effect of natural inſtinct chiefly; in man it depends partly on habit, partly on ſtrength of nerves, and partly on want of conſideration. But fortitude is the virtue of a rational and conſiderate mind, and is founded in a ſenſe of honour and a regard to duty. There may be courage in fighting a duel, though that folly is more frequently the effect of cowardice; there may be courage in an act of piracy or robbery: but there can be no fortitude in perpetrating a crime. Fortitude implies a love of equity and of public good; for, as Plato and Cicero obſerve, courage exerted for a ſelfiſh purpoſe, or

Fortitude.

Fortitude. without a regard to juſtice, ought to be called audacity rather than fortitude.

This virtue takes different names, according as it acts in oppoſition to different ſorts of evil; but ſome of thoſe names are applied with conſiderable latitude. With reſpect to danger in general, fortitude may be termed *intrepidity;* with reſpect to the dangers of war, *valour;* with reſpect to pain of body or diſtreſs of mind, *patience;* with reſpect to labour, *activity;* with reſpect to injury, *forbearance;* with reſpect to our condition in general, *magnanimity.*

Fortitude is very becoming in both ſexes; but courage is not ſo ſuitable to the female character; for in women, on ordinary occaſions of danger, a certain degree of timidity is not unſeemly, becauſe it betokens gentleneſs of diſpoſition. Yet from thoſe of very high rank, from a queen or an empreſs, courage in emergencies of great public danger would be expected, and the want of it blamed; we ſhould overlook the ſex, and conſider the duties of the ſtation. In general, however, maſculine boldneſs in a woman is diſagreeable; the term *virago* conveys an offenſive idea. The female warriors of antiquity, whether real or fabulous, Camilla, Thaleſtris, and the whole community of AMAZONS, were unamiable perſonages. But female courage exerted in defence of a child, a huſband, or a near relation, would be true fortitude, and deſerve the higheſt encomiums.

The motives to fortitude are many and powerful. This virtue tends greatly to the happineſs of the individual, by giving compoſure and preſence of mind, and keeping the other paſſions in due ſubordination. To public good it is eſſential; for without it, the independence and liberty of nations would be impoſſible. It gives to a character that elevation which poets, orators, and hiſtorians, have in all ages vied with one another to celebrate. Nothing ſo effectually inſpires it as rational piety; the fear of God is the beſt ſecurity againſt every other fear. A true eſtimate of human life; its ſhortneſs and uncertainty; the numberleſs evils and temptations to which by a long continuance in this world we muſt unavoidably be expoſed; ought by no means to diſcourage or to throw any gloom on our future proſpects: they ſhould teach us, that many things are more formidable than death; and that nothing is loſt, but much gained, when, by the appointment of Providence, a well ſpent life is brought to a concluſion.

Let it be conſidered too, that puſillanimity and fearfulneſs can never avail us any thing. On the contrary, they debaſe our nature, poiſon all our comforts, and make us deſpicable in the eyes of others; they darken our reaſon, diſconcert our ſchemes, enfeeble our efforts, extinguiſh our hopes, and add tenfold poignancy to all the evils of life. In battle, the brave ſoldier is in leſs danger than the coward; in leſs danger even of death and wounds, becauſe better prepared todefend himſelf; in far leſs danger of infelicity; and has before him the animating hope of victory and honour. So in life, the man of true fortitude is in leſs danger of diſappointment than others are, becauſe his underſtanding is clear, and his mind diſencumbered; he is prepared to meet calamity without the fear of ſinking under it: and he has before him the near proſpect of another life, in which they who piouſly bear the evils of this will obtain a glorious reward. Fortitude ‖ Fortune.

FORTUNA, a goddeſs worſhipped with great devotion by the ancient Greeks and Romans; who believed her to preſide over human affairs, and to diſtribute wealth and honour at her pleaſure. See FORTUNE.

FORTUNATE ISLANDS, in *Ancient Geography*, certain iſlands (concerning the ſituation of which authors are not agreed), famous for the golden apples of the HESPERIDES.—The common opinion is, that they are the *CANARY Iſlands.*

FORTUNE (Τυχη), a name which among the ancients ſeems to have denoted a principle of fortuity, whereby things came to paſs, without being neceſſitated thereto: but what and whence that principle is, they do not ſeem to have ever preciſely thought. Hence their philoſophers are often intimating, that men only framed the phantom *Fortune* to hide their ignorance; and that they call *Fortune* whatever befals a man without his knowing for what purpoſe. Hence Juvenal (ſat. x. ver. 366.) affirms, they were men who made a deity of fortune.

Nullum numen abeſt, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, deam, cæloque locamus..

The ingenious Mr Spence gives another reading of this paſſage:

Nullum numen habes, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, deam, cæloque locamus.

This reading, he thinks agrees beſt with the context: Juvenal ſays, ver. 356, that the two things we ſhould pray for are good health and good ſenſe; that we might be the authors of our own happineſs if we pleaſed, ver. 363.; that virtue is the only way to true happineſs, ver. 364.; that if we ourſelves are prudent, Fortune has no power over us; and that, in truth, ſhe is no goddeſs at all, and has only uſurped a ſeat in heaven from the folly of mankind, ver. 366. Fortune was not conſidered as a deity by the old Romans, but was made ſo by the devotion and folly of the vulgar; and Mr Spence ſays, that he has ſeen an ancient gem, in which Cybele, the mother of the gods, is repreſented as turning away her head from Fortune, in an attitude of diſowning and rejecting her; (Polymetis, p. 150, 154, &c.).

According to the opinion of the heathens, therefore, fortune in reality was only the arrival of things in a ſudden and unexpected manner, without any apparent cauſe of reaſon: ſo that the philoſophical ſenſe of the word coincides with what is vulgarly called *chance.*

But in religion it had a farther force; altars and temples in great numbers were conſecrated to this Fortune, as a deity. This intimates, that the heathens had perſonified, and even deified, their chance; and conceived her as a ſort of goddeſs, who diſpoſed of the fate of men at her pleaſure. Hence that invocation of Horace, *O diva, gratum quæ regis Antium,* in the 35th ode of the firſt book, where he recommends Auguſtus, then preparing for a viſit to Britain, to her protection. From theſe different ſentiments it may be inferred, that the ancients at one time took Fortune for a peremptory cauſe, bent upon doing good to ſome,

Fortune, Forty.

ſome, and perſecuting others; and ſometimes for a blind inconſtant cauſe, without any view or determination at all.

If then the word *fortune* had no certain idea in the mouth of thoſe who erected altars to her, much leſs can it be aſcertained what it denotes in the mind of thoſe who now uſe the word in their writings. They who would ſubſtitute the name *Providence* in lieu of that of *Fortune*, cannot give any tolerable ſenſe to half the phraſes wherein the word occurs.

Horace paints the goddeſs, preceded by Neceſſity, holding nails and wedges in her hands, with a crampiron, and melted lead to faſten it; rarely accompanied with Fidelity, unleſs when ſhe abandons a family; for in that caſe Fidelity never fails to depart with her, as well as friends.

She is diſreſpectfully ſpoken of by moſt of the Roman writers, and repreſented as blind, inconſtant, unjuſt, and delighting in miſchief, (*Ovid. ad Liv.* ver. 52, ver. 374. (*Hor.* lib. i. od. 34. ver. 26. lib. iii. od. 29. ver. 15. *Statius*, Theb. xii. ver 505.). However they had a good as well as a bad Fortune, a conſtant and inconſtant Fortune; the latter of which was repreſented with wings, and a wheel by her, (*Hor.* lib. iii. od. 29. ver. 56.). Juvenal alludes to a ſtatue of Fortune, which exhibited her under a very good character, as the patroneſs of the poor infants that were expoſed by their parents in the ſtreets, (*Sat.* vi. ver. 605.).

The painters repreſent her in a woman's habit, with a bandage before her eyes, to ſhow that ſhe acts without diſcernment; and ſtanding on a wheel, to expreſs her inſtability. The Romans, ſays Lactantius, repreſented her with a cornucopia, and the helm of a ſhip, to ſhow that ſhe diſtributes riches, and directs the affairs of the world. In effect, it is with ſuch characters that we ſee her repreſented on ſo many medals, with the inſcription, FORTVNA AVG. FORTUNA REDVX, FORTVNÆ AVG. or REDVCIS, &c. Sometimes ſhe is ſeen pointing at a globe before her feet, with a ſceptre in one hand, and holding the cornucopia in the other.

The Romans had a virile as well as a muliebrian Fortune, for the objects of their adoration: the *Fortuna virilis* was honoured by the men, and the *Fortuna muliebris* by the women. They honoured Fortune alſo under a variety of other appellations.

The Romans derived the worſhip of Fortune from the Greeks, under the reign of Servius Tullius, who dedicated the firſt temple to her in the public market. Nero alſo built a temple to Fortune. The Fortune worſhipped at Antium was probably of the moſt exalted character of any among the Romans; if we may judge by the account which Horace gives us of the great ſolemn proceſſions that were made to her, (*Hor.* lib. i. od. 35. ver. 22.). But the moſt celebrated temple of Fortune was at Præneſte. Statius ſpeaks of ſeveral Fortunes there, and calls them the *Prænestinæ sorores*, (lib. i. Sylv. iii. ver. 80.).

FORTUNE-Tellers. Perſons pretending to tell fortunes are to be puniſhed with a year's impriſonment, and ſtanding four times on the pillory. Stat. ix. Geo. II. c. 5.

FORTY DAYS *Court*, the court of *attachment* or *woodmote*, held before the verderors of the foreſt once every forty days, to inquire concerning all offenders againſt vert and veniſon. See ATTACHMENT.

Forum.

FORUM, in Roman antiquity, a public ſtanding place within the city of Rome, where cauſes were judicially tried, and orations delivered to the people.

FORUM was alſo uſed for a place of traffic, anſwering to our market-place. Theſe were generally called *fora venalia*; in contradiſtinction to the former, which were called *fora civilia*.

The *fora civilia* were public courts of juſtice, very magnificent in themſelves, and ſurrounded with porticoes and ſtately edifices; of theſe there were ſix very remarkable: 1. *Forum Romanum.* 2. *Julianum.* 3. *Auguſtum.* 4. *Palladium.* 5. *Forum Trajani.* 6. *Forum Saluſtii.* The *Forum Romanum* was the moſt noted, and is often called ſimply *Forum*, by way of eminence. Here was the pleading place called *Roſtra*, the *Comitium*, the ſanctuary of *Saturn*, temple of *Caſtor*, &c. See ROSTRA, COMITIUM, &c.

The *fora venalia*, or market-places, were very numerous. The chief of them were the *forum boarium* for oxen or beef; *ſuarium* for ſwine; *piſtorium* for bread; *cupediuarium* for dainties; *olitorium* for garden ſtuff.

The Grecian Αγορα exactly correſpond with the Roman *fora*, being places where courts and markets were held. At Athens they had many *fora*, but the chief of them were the *old* and the *new*.

FORUM Indicere, was the act of the prætor appointing the place in Rome where cauſes were to be tried. *Agere forum* denoted the bringing on cauſes out of Rome, in a Roman province (Cicero, Suetonius); the ſame with *agere conventum* (Florus).

The term *forum* added to a proper name, denoted ſome market town or borough; as,

FORUM Allieni, a place mentioned only by Tacitus; and, from what he ſays of it, thought to be *Ferrara*, capital of the duchy of that name in Italy. E. Long. 12. 5. N. Lat. 44. 46.

FORUM Appii (Cicero, Luke); a town of the Volſci, in Latium, on the Via Appia, a little beyond the Tres Tabernæ; ſet down in the Jeruſalem Itinerary as ſituated near the river Nymphæus: now entirely extinct.

FORUM Cornelii, a town of the Ciſpadana, built by Sylla: Now *Imola*, a city in Romagna, and territory of the Pope. E. Long. 12. 12. N. Lat. 44. 30.

FORUM Domitii, a town of Gallia Narbonenſis; probably built by Domitius Ahenobarbus, who commanded in thoſe parts: Now *Frontignan*, or *Frontiguiac*, in Languedoc, near the Mediterranean. E. Long. 3. 30. N. Lat. 43. 30.

FORUM Fulvii, a town of Liguria, ſurnamed *Valentinum*: from which it is conjectured that it is now *Valenza*, in the duchy of Milan; which is confirmed by Peutinger's diſtances. E. Long. 9°. N. Lat. 45°.

FORUM Gallorum, a ſmall town of the Ciſpadana, on the Via Æmilia, eight miles from Mutina, beyond the river Scultenna. Here Antony defeated Panſa, and was in his turn defeated by Hirtius: Now *Caſtelfranco*, in the territory of Bologna.—Another *Forum Gallorum*, a town of the Vaſcones in the Hither Spain: Now *Gurrea*, a ſmall town of Arragon.

FORUM Julium. There are ſeveral towns of this name; as a *Forum Julium* of Gallia Narbonenſis; or *Forojulium*: Now *Frejus*, or *Frejules*, in Provence, at

Forum || Foſſarii.

the mouth of the Argens. *Forum Julium Carnorum*, to the north of Aquileia, in the Tranſpadana: Now *Cividal di Friuli*, formerly *Cividal d' Auſtria*, in the territory of Venice.

Forum Jutuntorum, a town of the Inſubres, in the Tranſpadana: Now *Crema*, capital of the Cremaſco, in the territory of Venice. E. Long. 10. 15. N. Lat. 45. 20.

Forum Livii, a town of the Semnones, in the Ciſpadana: Now *Forli*, in Romagna. E. Long. 12. 45. N. Lat. 44. 25.

Forum Seguſianorum, ſituated on the eaſt ſide of the Liger, in Gallia Celtica: now *Feurs*, on the Loire, in the Lyonnois, capital of the territory of Forez. E. Long. 4. 15. N. Lat. 45. 44.

Forum Tiberii, a town of the Pagus Tigurinus, in Belgica, on the left or ſouth ſide of the Rhine: Now *Kayſerſtull*; literally the tribunal of Tiberius, which he held there when commander in the Rhetian war.

Forum Volcani (Strabo); the *Campi Phlegræi* of Pliny; a place in Campania encompaſſed with rocky eminences, near Puteoli, and diſtant from it two miles towards Naples, emitting ſmoke, and in ſome places flame, like a large extenſive furnace, and yielding ſulphur: Now called *Solfatara*, in the Terra di Lavoro.

Forum is alſo uſed, among caſuiſts, &c. for juriſdiction; thus they ſay, *In foro legis*, &c.

FOSS, or Fosse, in *Fortification*, &c. a ditch or moat. The word is French, formed of the Latin participle *foſſum*, of the verb *fodio*, "I dig."

Foss, *Foſſa*, in *Anatomy*, a kind of cavity in a bone, with a large aperture, but no exit or perforation. When the aperture is very narrow, it is called a *ſinus*.

Foss is particularly uſed for the cavity or denture in the back part of the neck.

FOSSA magna, or Naviculares, is an oblong cavity, forming the inſide of the *pudendum muliebre*, and which preſents itſelf upon opening the labia; and in the middle whereof are the *carunculæ myrtiformes*. See Anatomy.

Fossa, in our ancient cuſtoms, was a ditch full of water, where women committing felony were drowned; as men were hanged: *Nam et ipſi in omnibus tenementis ſuis omnem ab antiquo legalem habuere juſtitiam, videlicet ferrum, foſſam, furcas, et ſimilia.* In another ſenſe it is taken for a grave, as appears by theſe old verſes:

Hic jacent in foſſa Bedæ venerabilis oſſa:
Hic eſt foſſatus, qui bis erat hic cathedratus.

Foss Way was anciently one of the four great Roman highways of England: ſo called, according to Camden, becauſe it was ditched on both ſides, which was the Roman method of making highways.

FOSSARII, in antiquity, a kind of officers in the eaſtern church, whoſe buſineſs was to inter the dead.

Ciaconius relates, that Conſtantine created 950 foſſaries, whom he took out of the divers colleges or companies of tradeſmen: he adds, that they were exempted from taxes, ſervices, burdenſome offices, &c.

F. Goar, in his notes on the Greek Euchologion, inſinuates that the foſſarii were eſtabliſhed in the times of the apoſtles; and that the young men, who carried off the body of Ananias, and thoſe perſons full of the fear of God who interred St Stephen, were of the number. Foſſarii || Foſſil.

St Jerome aſſures us, that the rank of foſſarii held the firſt place among the clerks; but he is to be underſtood of thoſe clerks only who had the direction and intendance of the interment of the devout.

FOSSE, the Roman military way in South Britain, begins at Totneſs, and paſſes through Exeter, Ivelcheſter, Shepton Mallet, Bath, Cirenceſter, Leiceſter, the Vale of Belvoir, Newark, Lincoln, to Barton upon the Humber, being ſtill viſible in ſeveral parts, though of 1400 years ſtanding. It had the name from the foſſes or ditches made by the ſides of it.

FOSSIL, in *Natural Hiſtory*, denotes, in general, every thing dug out of the earth, whether it be a native thereof, as metals, ſtones, ſalts, earths, and other minerals; or extraneous, repoſited in the bowels of the earth by ſome extraordinary means, as earthquakes, the deluge, &c.

Native foſſils are ſubſtances found in the earth, or on its ſurface, of a ſimple ſtructure, exhibiting no appearances of organization; and theſe are included under the general names of ſimple and compound, earthy or metallic minerals. See Mineralogy.

Extraneous foſſils are bodies of the vegetable or animal kingdoms accidentally buried in the earth. Of the vegetable kingdom, there are principally three kinds; trees or parts of them, herbaceous plants, and corals: and of the animal kingdom there are four kinds; ſea ſhells, the teeth or bony palates and bones of fiſhes, complete fiſhes, and the bones of land animals. See Geology.

Theſe adventitious or *extraneous* foſſils, thus found buried in great abundance in divers parts of the earth, have employed the curioſity of ſeveral of our lateſt naturaliſts, who have each their ſeveral ſyſtem to account for the ſurpriſing appearances of petrified ſea fiſhes, in places far remote from the ſea, and on the tops of mountains; ſhells in the middle of quarries of ſtone; and of elephants teeth, and bones of divers animals, peculiar to the ſouthern climates, and plants only growing in the eaſt, found foſſil in our northern and weſtern parts.

Some will have theſe ſhells, &c. to be real ſtones, and ſtone plants, formed after the uſual manner of other figured ſtones; of which opinion is the learned Dr Liſter.

Another opinion is, that theſe foſſil ſhells, with all the foreign bodies found within the earth, as bones, trees, plants, &c. were buried therein at the time of the univerſal deluge; and that, having been penetrated either by the bituminous matter abounding chiefly in watery places, or by the ſalts of the earth, they have been preſerved entire, and ſometimes petrified.

Others think, that thoſe ſhells, found at the tops of the higheſt mountains, could never have been carried thither by the waters, even of the deluge; inaſmuch as moſt of theſe aquatic animals, on account of the weight of their ſhells, always remain at the bottom of the water, and never move but cloſe along the ground. They imagine, that a year's continuance of the waters of the deluge, intermixed with the ſalt waters of the ſea, upon the ſurface of the earth, might well give occaſion to the production of ſhells of divers kinds in different climates;

Foſter. climates; and that the univerſal ſaltneſs of the water was the real cauſe of their reſemblance to the ſea ſhells, as the lakes formed daily by the retention of rain or ſpring water produce different kinds.

Others think, that the waters of the ſea, and the rivers, with thoſe which fell from heaven, turned the whole ſurface of the earth upſide down; after the ſame manner as the waters of the Loire, and other rivers, which roll on a ſandy bottom, overturn all their ſands, and even the earth itſelf, in their ſwellings and inundations; and that in this general ſubverſion, the ſhells came to be interred here, fiſhes there, trees there, &c. See DELUGE.

Dr Woodward, in his Natural Hiſtory of the Earth, purſuing and improving the hypotheſis of Dr Burnet, maintains the whole maſs of earth, with every thing belonging thereto, to have been ſo broken and diſſolved at the time of the deluge, that a new earth was then formed on the boſom of the water, conſiſting of different ſtrata or beds of terreſtrial matter, ranged over each other uſually according to the order of their ſpecific gravities. By this means, plants, animals, and eſpecially fiſhes and ſhells, not yet diſſolved among the reſt, remained mixed and blended among the mineral and foſſil matters; which preſerved them, or at leaſt aſſumed and retained their figures and impreſſions either indentedly or in relievo. See GEOLOGY.

FOSSIL Pitch. See PETROLEUM, MINERALOGY *Index*.

FOSTER JAMES, a nonconformiſt divine, very highly celebrated for his pulpit eloquence and erudition, was born at Exeter in the year 1697. At the age of five years he was put to the free ſchool of that city, where his progreſs in the acquiſition of grammar was ſo rapid, that his maſter boaſted of him as the moſt eminent genius in his ſchool. From this ſeminary he went to the academy where young men deſigned for clergymen in the diſſenting intereſt were educated, where his progreſs and applauſe were equally great. His apprehenſion was remarkably quick, his judgment ſolid, memory retentive, eloquence commanding, and his talents for argumentation were truly admirable; but above all, his piety was genuine, and few men poſſeſſed candour, modeſty, liberality, integrity, tenderneſs and benevolence, in ſuch a remarkable degree. He commenced preacher at the age of 21, and was much admired where he occaſionally officiated. About this time the doctrine of the trinity was much agitated in the weſt of England, which was not conſonant to the notions of Mr Foſter, and the honeſty and openneſs of his heart would not allow him to conceal theſe, which brought ſo much odium upon him from the orthodox party, that he retired to another ſcene of action. He became paſtor of a congregation at Milborne-port, in Somerſetſhire; but as ſoon as his hearers became zealouſly attached to what was deemed the orthodox opinion, he retired to Aſhwick under the hills of Mendip, in the ſame county. In this aſylum he preached to two congregations at a little diſtance from each other, as poor as they were plain, the united contributions of which did not amount to 15l. per annum. In this humble poverty and obſcurity he lived for ſome years, honourable, however, as it was occaſioned by his determined uprightneſs and ſincerity. In the year 1720, he gave the world his "Eſſay on Fundamentals, with a particular regard to the doctrine of the ever-bleſſed Trinity," &c. The deſign of this work was to check an uncharitable and intolerant ſpirit, at that time extremely prevalent, by ſhowing that the trinitarian notion is not a fundamental article of Chriſtianity, or made an expreſs condition of ſalvation in the ſacred ſcriptures. A ſermon accompanied this eſſay, entitled "The reſurrection of Chriſt proved, and vindicated againſt the moſt important objections of the ancient Jews, or modern Deiſts, and his diſciples ſhown to be ſufficient witneſſes of the fact." From Aſhwick he removed to Trowbridge in Wiltſhire, where his congregation did not uſually exceed 20 or 30 people. Foſter.

By reading Dr Gale's treatiſe on infant baptiſm, he became a convert to the doctrine, that immerſion is the true ſcriptural rite, and was accordingly ſoon after baptiſed in London in conformity to that mode. This unreſerved manner of adopting whatever his conſcience believed to be truth, excluded him from almoſt every religious party among whom he might otherwiſe have expected preferment. But while he deliberated with himſelf whether he ſhould abandon the miniſtry, and acquire the knowledge of ſome mechanical employment, Robert Houlſton, Eſq. took him to his houſe in the capacity of chaplain, where his circle of acquaintances became wider and more reſpectable. In 1724, he was appointed to ſucceed Dr Gale in the baptiſt congregation in Barbican, London. In the year 1728 he commenced a Sunday evening lecture in the Old Jewry, which he continued till within a ſhort time of his death, with ſuch a degree of popularity as few diſſenters at that time experienced. In 1731 appeared his valuable work, entitled "The uſefulneſs, truth, and excellency of the Chriſtian revelation, defended againſt the objections contained in a late book, called Chriſtianity as old as the Creation," &c. In this reply Mr Foſter exhibited no ordinary ſhare of talents and ingenuity, and it was admired by the candid and judicious of every deſcription. Dr Tindal, againſt whom it was written, is ſaid to have ſpoken of it always with great reſpect. He publiſhed a volume of ſermons in the year 1734, followed by other three volumes, the laſt of which appeared in 1744. At this time he was appointed ſucceſſor to Dr Jeremiah Hunt, in the proteſtant congregation at Pinner's-hall. In 1746, he attended the earl of Kilmarnock when under ſentence of death for high-treaſon, after which he publiſhed an octavo pamphlet, with the title of "An account of the behaviour of the late earl of Kilmarnock after his ſentence, and on the day of his execution."

He received from the Mariſchal college of Aberdeen the degree of doctor in divinity, accompanied with handſome letters from the principal and Profeſſor Fordyce, the latter of whom thus addreſſed him. "We beg that you will be ſo good as to accept of the diploma, as a ſmall mark of the ſincere veneration we have for you, and of the ſenſe we entertain of the eminent ſervices you have done to the cauſe of liberty, religion, and virtue, by your writings as well as public inſtructions." The firſt volume in quarto of his 'Diſcourſes on all the Principal Branches of Natural Religion and Social Virtue,' was publiſhed in the year 1749, and the ſecond appeared in 1752. They were publiſhed by ſubſcription; and to evince the high eſtimation in which his

Foſter ‖ Fothergill.

his talents and virtue were held, 2000 names were contained in the liſt, many of them diſtinguiſhed by their dignified rank and literary abilities.

In the month of April 1750, he was ſeized with a violent diſtemper, from the effects of which he never thoroughly recovered; yet while at all able to officiate, he continued to preach till the beginning of 1752, when he had another attack, which ſeems to have been of a paralytic nature. After declining for ſome time, he expired like a genuine Chriſtian on the 5th of November, in the 55th year of his age. His private and public life were alike irreproachable. Such was the wonderful extent of his beneficence, that he muſt have died in indigent circumſtances, had it not been for the numerous ſubſcriptions to his diſcourſes on natural religion. Mr Rider gives him the following eulogium. "His voice was naturally ſweet, ſtrong, diſtinct, harmonious, always adapted to his matter, always varied as his method changed; as expreſſive of the ſenſe as the moſt judicious recitative. Monotony was a fault he was never guilty of. His action, the ſoul of eloquence, was grave, expreſſive, free from diſtortions, animated without being theatrical; in ſhort, ſuch as became the pulpit. He reminded us of Paul at Athens, arreſting the attention of his auditors." It was no doubt ſuch rare accompliſhments which induced Mr Pope to be an occaſional hearer, and to pay him the following compliment:

Let modeſt Foſter, if he will, excel
Ten metropolitans in preaching well.

In a poem deſcribing the reſpective merits of diſſenting miniſters at that period, and ſuppoſed to have been the work of Mr Savage, we find the following lines upon Dr Foſter.

But ſee th' accompliſh'd orator appear,
Refin'd his language, and his reaſoning clear;
Thou only, Foſter, haſt the pleaſing art,
At once to charm the ear, and mend the heart.

Beſides the works formerly taken notice of, Dr Foſter publiſhed three funeral ſermons, one of which was intended for that celebrated confeſſor Mr Emlyn; together with a number of eſſays in the Old Whig.

FOSTER, *Samuel*, an ingenious Engliſh mathematician of the laſt century, and aſtronomical profeſſor in Greſham college, was one of that learned aſſociation which met for cultivating the new philoſophy during the political confuſions, and which Charles II. eſtabliſhed into the Royal Society. Mr Foſter, however, died in 1652, before this incorporation took place; but wrote a number of mathematical and aſtronomical treatiſes, too many to particularize. There were two other mathematical ſtudents of this name; William Foſter, a diſciple of Mr Oughtred, who taught in London; and Mark Foſter, author of a treatiſe on trigonometry, who lived later than the former two.

FOTHER, or FODDER, is a weight of lead, containing eight pigs, and every pig one and twenty ſtone and a half; ſo that it is about a ton or common cart load. Among the plumbers in London, it is nineteen hundred and a half; and at the mines it is two and twenty hundred and a half. The word is of Teutonic origin, from *fuder*.

FOTHERGILL, DR GEORGE, was born in Weſtmorland in 1705, where his family had been long ſeated on a competent eſtate that had deſcended regularly for ſeveral generations. After an academical education in Queen's college, Oxford, of which he became a fellow, he was, in 1751, elected principal of St Edmund's hall, and preſented to the vicarage of Brumley in Hampſhire. Having been long afflicted with an aſthma, he died in 1760. He was the author of a collection of much eſteemed ſermons, in 2 vols. 8vo. The firſt volume conſiſts of occaſional diſcourſes, publiſhed by himſelf; the ſecond printed from his MSS. Fothergill.

FOTHERGILL, *Dr John*, a late eminent phyſician, ſon of John and Margaret, Quakers, was born in 1712, at Carr End in Yorkſhire, where his father, who had been a brewer at Knareſborough (after having travelled from one end of America to the other), lived retired on a ſmall eſtate which he cultivated. The Doctor was the ſecond of five children (four ſons and a daughter), and received his education under the care of his grandfather Thomas Hough, a perſon of fortune in Cheſhire, which gave him a predilection for that county), and at Sedbergh in Yorkſhire. He afterwards ſerved his time to one Mr Bartlett an apothecary at Bradford. From thence he removed to London, and became a pupil of Dr (afterwards Sir Edward) Wilmot, at St Thomas's Hoſpital. He then went to the univerſity of Edinburgh to ſtudy phyſic, and took his doctor's degree there. From Edinburgh he went to Leyden; whence, after a ſhort ſtay, he returned to London, and began to practiſe about the year 1740, in a houſe in White-hart Court, Lombard-ſtreet, where he reſided during the greateſt part of his life, and acquired moſt of his fortune. In 1746, he was admitted a licentiate of the College of Phyſicians in London; and in 1754 a fellow of that of Edinburgh, to which he was a conſiderable benefactor. He afterwards became a member of the Royal Medical Society at Paris, and a member both of the Royal and Antiquarian Societies. He continued his practice with uninterrupted ſucceſs till within the laſt two years of his life, when the illneſs which he had brought on himſelf by unremitted attention, obliged him to give up a conſiderable part of it. Beſides his application to medical ſcience, he had imbibed an early taſte for natural hiſtory, improved by his friend Peter Collinſon, and employed himſelf on conchology and ſmaller objects of botany. He was for many years a valuable contributor to the Gentleman's Magazine; where his obſervations on the weather and diſeaſes were begun in April 1751, and diſcontinued in the beginning of 1756, being diſappointed in his views of exciting other experienced phyſicians in different parts to imitate the example. He had very extenſive practice, but he did not add to his art any great or various improvements. His pamphlet on the ulcerous ſore throat is, on every account, the beſt of his publications; but owes much of its merit to the information of the late Dr Letherland. It was printed in 1748, on the re-appearance of that fatal diſorder which in 1739 had carried off the two only ſons of Mr Pelham. In 1762 Dr Fothergill purchaſed an eſtate at Upton in Eſſex; and formed a botanic garden there, the ſecond in Europe; Kew is the firſt. In 1766 he began regularly to withdraw, from Midſummer to Michaelmas, from the exceſſive fatigue of his profeſſion, to Lee Hall, near Middlewich, in Cheſhire; which, though he only rent-

Fothergill. ed it by the year, he had ſpared no expence to improve. He took no fees during this receſs, but attended to preſcribe gratis at an inn at Middlewich once a week. In 1767, after he found himſelf obliged to relax his attention to buſineſs, he removed from his houſe in the city, to reſide in Harpur-ſtreet, Red-Lion Square. Some time before his death he had been induſtrious to contrive a method of generating and preſerving ice in the Weſt Indies. He was the patron of Sidney Parkinſon, and drew up the preface prefixed to his account of the voyage to the South Seas. At his expence alſo was made and printed an entire new tranſlation of the whole Bible, from the Hebrew and Greek originals, by Anthony Purver, a Quaker, in two volumes, 1764, folio, and alſo, in 1780, an edition of Biſhop Percy's "Key to the New Teſtament," adapted to the uſe of a ſeminary of young Quakers, at Acworth, near Leeds in Yorkſhire, founded in 1778 by the Society, who purchaſed, by a ſubſcription in which Dr Fothergill ſtood foremoſt, the houſe and an eſtate of thirty acres which the Foundling Hoſpital held there, but which they found inconvenient for their purpoſe on account of diſtance. The Doctor himſelf firſt projected this on the plan of a ſmaller inſtitution of the ſame kind at Gilderſomes. He alſo endowed it handſomely by his will. It now contains above 300 children of both ſexes, who are clothed and inſtructed. Among the other beneficent ſchemes ſuggeſted by Dr Fothergill were thoſe of bringing fiſh to London by land carriage, which, though it did not in every reſpect ſucceed, tended to deſtroy a ſuppoſed combination: and of rendering bread much cheaper, though equally wholeſome, to the poor, by making it with one part of potatoes and three parts of houſehold flour. But his public benefactions, his encouragements of ſcience, the inſtances of his attention to the health, the police, the convenience of the metropolis, &c. we cannot pretend to ſpecify. The fortune which Dr Fothergill had acquired was immenſe; and, taking all things together, the houſe and moveables in Harpur-ſtreet, the property in Eſſex, and the eſtate in Cheſhire (which he held on a leaſe), and his ready money, amounted to 80,000l. His buſineſs, when he was in full practice, was calculated at near 7000l. per annum. In the influenza of 1775 and 1776, he is ſaid to have had 60 patients on his liſt daily, and his profit was eſtimated at 8000l. per annum.

The diſorder which haſtened his death was a ſcirrhus of the proſtata, and an obſtruction in the bladder (in which were found after his death two quarts of water), which had been gradually coming on him for ſix years paſt, occaſioned by a delicacy, which made him unwilling to alight from his carriage, and when, after his temporary recovery from it the year before he died, he ſubmitted to uſe relief in his carriage, it was too late. He died at his houſe in Harpur-ſtreet, December 26. 1780; and his remains were interred, January 5. in the Quakers burying ground at Winchmore-hill, whither they were accompanied by more than 70 coaches and poſt-chaiſes, notwithſtanding the intention of the executors to have the funeral private. The Doctor by his will appointed, that his ſhells and other pieces of natural hiſtory ſhould be offered to the late Dr Hunter at 500l. under the valuation he ordered to be taken of them. Accordingly Dr Hunter bought them for 1200l. The drawings and collections in natural hiſtory were alſo to be offered to Mr (now Sir Joſeph) Bankes at a valuation. His Engliſh portraits and prints, which had been collected by Mr John Nickolls of Ware, and purchaſed by him for 80 guineas, were bought for 200 guineas by Mr Thane. His books were ſold by auction, April 30. 1781, and the eight following days. His houſe and garden at Upton, in which 15 men were conſtantly employed, were valued at 10,000l. He ſpared no expence to augment this as well as his other collections. He had an ingenious artiſt qualified to collect for him at the Cape of Good Hope, and another on the Alps, and employed for ſeveral years before his death a painter in natural hiſtory at Leeds.

Fothergill || Fotheringay.

Dr Fothergill's character was excellent. A tranſaction, indeed, with regard to one Dr Leeds, gave occaſion to ſome of his enemies to blame him; but how unjuſtly, has been abundantly ſhown by his biographers Dr Elliot and Dr Lettſome. Beſides the pamphlet already mentioned, Dr Fothergill wrote a conſiderable number of Tracts, which are now collected into one volume 8vo, by Dr Elliot. He ſometimes wrote in the newſpapers, and is ſaid to have been the author of more than 100 letters in the Gazetteer, concerning the New Pavement.

FOTHERGILLA, a genus of plants belonging to the polyandria claſs. See BOTANY *Index*.

FOTHERING, a peculiar method of endeavouring to ſtop a leak in the bottom of a ſhip while ſhe is afloat, either under ſail or at anchor. It is uſually performed in the following manner: A baſket is filled with aſhes, cinders, and chopped rope yarns, and looſely covered with a piece of canvas; to this is faſtened a long pole, by which it is plunged repeatedly in the water, as cloſe as poſſible to the place where the leak is conjectured to lie. The oakum or chopped rope yarns being thus gradually ſhaken through the twigs, or over the top of the baſket, are frequently ſucked into the hole along with the water, ſo that the leak becomes immediately choked; and the future entrance of the water is thereby prevented.

FOTHERINGAY, a town of Northamptonſhire, about four miles from Stamford, ſituated on the river Avon, or Nen, and conſiſting of one ſtreet. Edward duke of York, in the reign of Henry V. founded and endowed a fine collegiate church here, in which he was interred. At the diſſolution, the college and the choir were pulled down, and the bodies of the founder and his family left expoſed till Queen Elizabeth's time, who ordered them to be interred, and the preſent monuments to be erected. On the north ſide of the church is a free ſchool, founded by Henry VII. or Edward VI. endowed with 20l. per annum for a maſter, payable out of the exchequer by the receiver of the county. The bridge over the river here was firſt built by Queen Elizabeth, 1573, of timber, with three pillars upon the foundation. Daniel, firſt earl of Nottingham, and the other truſtees for William Saville, marquis of Halifax, rebuilt it, in 1722, of freeſtone from King's Cliffe. On the ſouth-eaſt ſide of the cliffe ſtood the caſtle; which was of great antiquity and conſiderable ſtrength. Mary queen of Scots, who had been in the cuſtody of Sir Amias

Fotheringay || Foulahs.

Amias Powlet here, was tried and beheaded in the hall; and her ſon afterwards, forgiving and even taking into favour her greateſt enemy Cecil, only took the childiſh revenge of beating down the caſtle; which he ſo completely demoliſhed, that no more than the earthworks now remain. Within the firſt work is a farm-houſe, with ſome carved ſtones wrought into it, and at the ſouth-weſt corner of the inner trench are ſome maſſes of ſtone walls. Sir Robert Cotton carried the wainſcot of the hall to Connington.

FOU-TCHEOU, a city of China, in the province of FO-KIEN. It carries on a conſiderable trade; but is chiefly remarkable for the magnificence of its principal bridge, which has more than 100 arches, conſtructed of white ſtone, and ornamented with a double baluſtrade throughout. This city is the reſidence of a viceroy, and has under its juriſdiction nine cities of the third claſs.

FOUGADE, or FOUGASSE, in the art of war, a little mine, about 8 or 10 feet wide, and 10 or 12 deep, dug under ſome work or poſt, which is in danger of falling into the enemy's hands; and charged with ſacks of powder, covered with ſtones, earth, and whatever elſe can make great deſtruction. It is ſet on fire like other mines, with a fauciſſe. See MINE.

FOUL, or FOULE, in the ſea language, is uſed when a ſhip has been long untrimmed, ſo that the graſs weeds, or barnacles, grow to her ſides under water. A rope is alſo foul when it is either tangled in itſelf, or hindered by another, ſo that it cannot run or be overhauled.

FOUL imports, alſo, the running of one ſhip againſt another. This happens ſometimes by the violence of the wind, and ſometimes by the careleſsneſs of the people on board, to ſhips in the ſame convoy, and to ſhips in port by means of others coming in. The damages occaſioned by running foul, are of the nature of thoſe in which both parties muſt bear a ſhare. They are uſually made half to fall upon the ſufferer, and half upon the veſſel which did the injury; but in caſes where it is evidently the fault of the maſter of the veſſel, he alone is to bear the damage.

FOUL-Water. A ſhip is ſaid to make foul water, when, being under ſail, ſhe comes into ſuch ſhoal water, that though her keel do not touch the ground, yet it comes ſo near it, that the motion of the water under her raiſes the mud from the bottom.

FOUL is alſo a diſeaſe in cattle, proceeding from blood, and a wateriſh rheum that falls down into the legs, and makes them ſwell.

FOUL or *Pimpled Face.* See *GUTTA Roſacea.*

FOULA, or *FOUL Iſland*, one of the Shetland iſles, lying between ſix and ſeven leagues weſt from the main land. It is about three miles long, narrow, and full of rough, ſteep, and bare rocks; one of which is ſo large, and runs up to ſuch a height, that it may be clearly ſeen from Orkney. This, it is probable, is the Thule of Tacitus. It has ſcarcely any paſturage, and but little arable land. The only commodities exported are ſtock fiſh, train oil, and feathers.

FOULAHS, a people of Africa, which inhabit the confines of the great deſert Sahara. The principal of the Foulah ſtates is that within Sierra Leona, and of which Teembo is the capital. See SIERRA LEONA.

FOUMART, a ſpecies of MUSTELA. See MAMMALIA *Index.* Foumart || Foundery.

FOUNDATION, in *Architecture*, is that part of a building which is under ground. See ARCHITECTURE, N° 104.

Palladio allows a ſixth part of the height of the whole building for the hollowing or under-digging; unleſs there be cellars under ground, in which caſe he would have it ſomewhat lower.

FOUNDATION, denotes alſo a donation or legacy, either in money or lands, for the maintenance and ſupport of ſome community, hoſpital, ſchool, &c.

The king only can found a college, but there may be a college in reputation founded by others. If it cannot appear by inquiſition who it was that founded a church or college, it ſhall be intended that it was the king, who has power to found a new church, &c. The king may found and erect an hoſpital, and give a name to the houſe upon the inheritance of another, or licenſe another perſon to do it upon his own lands; and the words *fundo*, *creo*, &c. are not neceſſary in every foundation, either of a college or hoſpital, made by the king; but it is ſufficient if there be words equivalent: the incorporation of a college or hoſpital is the very foundation; but he who endows it with lands is the founder; and to the erection of an hoſpital, nothing more is requiſite but the incorporation and foundation. Perſons ſeiſed of eſtates in fee ſimple, may erect and found hoſpitals for the poor by deed enrolled in chancery, &c. which ſhall be incorporated, and ſubject to ſuch viſitors as the founder ſhall appoint, &c. ſtat. 39 Eliz. c. 5. *Jacob's Law Dict.*

FOUNDER, in a general ſenſe, the perſon who lays a foundation, or endows a church, ſchool, religious houſe, or other charitable inſtitution. See FOUNDATION.

FOUNDER, alſo implies an artiſt who caſts metals, in various forms, for different uſes, as guns, bells, ſtatues, printing characters, candleſticks, buckles, &c. whence they are denominated gun-founders, bell-founders, figure-founders, letter-founders, founders of ſmall works, &c. See FOUNDERY.

FOUNDER, in the ſea language: A ſhip is ſaid to founder, when by an extraordinary leak, or by a great ſea breaking in upon her, ſhe is ſo filled with water, that ſhe cannot be freed of it; ſo that ſhe can neither veer nor ſteer, but lie like a log; and not being able to ſwim long, will at laſt ſink.

FOUNDERED, applied to horſes. See FARRIERY *Index.*

FOUNDERY, or FOUNDRY, the art of caſting all ſorts of metals into different forms. It likewiſe ſignifies the workhouſe or ſmelting hut wherein theſe operations are performed.

FOUNDERY of Small Works, or caſting in Sand. The ſand uſed for caſting ſmall works is at firſt of a pretty ſoft, yellowiſh, and clammy nature; but it being neceſſary to ſtrew charcoal duſt in the mould, it at length becomes of a quite black colour. The ſand is worked over and over, on a board, with a roller, and a ſort of knife; being placed over a trough to receive it, after it is by theſe means ſufficiently prepared.

This done, they take a wooden board of a length, and breadth proportional to the things to be caſt, and putting a ledge round it they fill it with ſand, a little moiſtened,

Foundery. moiſtened, to make it duly cohere. Then they take either wood or metal models of what they intend to caſt, and apply them ſo to the mould, and preſs them into the ſand, as to leave their impreſſion there. Along the middle of the mould is laid half a ſmall braſs cylinder, as the chief canal for the metal to run through, when melted, into the models or patterns; and from this chief canal are placed ſeveral others, which extend to each model or pattern placed in the frame. After this frame is finiſhed, they take out the patterns, by firſt looſening them all around, that the ſand may not give way.

Then they proceed to work the other half of the mould with the ſame patterns in juſt ſuch another frame; only that it has pins, which, entering into holes that correſpond to it in the other, make the two cavities of the pattern fall exactly on each other.

The frame, thus moulded, is carried to the melter; who, after extending the chief canal of the counterpart, and adding the croſs canals to the ſeveral models in both, and ſtrewing mill duſt over them, dries them in a kind of oven for that purpoſe.

Both parts of the mould being dry, they are joined together by means of the pins: and to prevent them giving way, by reaſon of the melted metal paſſing through the chief cylindrical canal, they are ſcrewed or wedged up like a kind of preſs.

While the moulds are thus preparing, the metal is fuſing in a crucible of a ſize proportionate to the quantity of metal intended to be caſt.

When the moulds are cooliſh, the frames are unſcrewed or unwedged, and the caſt work taken out of the ſand, which ſand is worked over again for other caſting.

FOUNDERY of Statues. The caſting of ſtatues depends on the due preparation of the pit, the core, the wax, the outer mould, the inferior furnace to melt off the wax, and the upper to fuſe the metal. The pit is a hole dug in a dry place ſomething deeper than the intended figure, and made according to the prominence of certain parts thereof. The inſide of the pit is commonly lined with ſtone or brick; or when the figure is very large, they ſometimes work on the ground, and raiſe a proper fence to reſiſt the impulſion of the melted metal.

The inner mould, or core, is a rude maſs to which is given the intended attitude and contours. It is raiſed on an iron grate, ſtrong enough to ſuſtain it, and is ſtrengthened within by ſeveral bars of iron. It is generally made either of potters clay, mixed with hair and horſe dung; or of plaſter of Paris mixed with brick duſt. The uſe of the core is to ſupport the wax, the ſhell, and leſſen the weight of the metal. The iron bars and the core are taken out of the braſs figure through an aperture left in it for that purpoſe, which is ſoldered up afterwards. It is neceſſary to leave ſome of the iron bars of the core, that contribute to the ſteadineſs of the projecting part, within the braſs figure.

The wax is a repreſentation of the intended ſtatue. If it be a piece of ſculpture, the wax ſhould be all of the ſculptor's own hand, who uſually forms it on the core: Though it may be wrought ſeparately in cavities, moulded on a model, and afterwards arranged on the ribs of iron over the grate; filling the vacant ſpace in the middle with liquid plaſter and brick duſt, whereby the inner core is proportioned as the ſculptor carries on the wax. Foundery.

When the wax, which is the intended thickneſs of the metal, is finiſhed, they fill ſmall waxen tubes perpendicular to it from top to bottom, to ſerve both as canals for the conveyance of the metal to all parts of the work; and as vent holes, to give paſſage to the air, which would otherwiſe occaſion great diſorder when the hot metal came to encompaſs it.

The work being brought thus far, muſt be covered with its ſhell, which is a kind of cruſt laid over the wax, and which being of a ſoft matter, eaſily receives the impreſſion of every part, which is afterwards communicated to the metal upon its taking the place of the wax, between the ſhell and the mould. The matter of this outer mould is varied according as different layers are applied. The firſt is generally a compoſition of clay, and old white crucibles well ground and ſifted, and mixed up with water to the conſiſtence of a colour fit for painting: accordingly they apply it with a pencil, laying it ſeven or eight times over, and letting it dry between whiles. For the ſecond impreſſion they add horſe dung and natural earth to the former compoſition. The third impreſſion is only horſe dung and earth. Laſtly, The ſhell is finiſhed by laying on ſeveral more impreſſions of this laſt matter, made very thick with the hand.

The ſhell, thus finiſhed, is ſecured by ſeveral iron girths, bound round it, at about half a foot diſtance from each other, and faſtened at the bottom to the grate under the ſtatue, and at top to a circle of iron where they all terminate.

If the ſtatue be ſo big that it would not be eaſy to move the moulds with ſafety, they muſt be wrought on the ſpot where it is to be caſt. This is performed two ways: in the firſt, a ſquare hole is dug under ground, much bigger than the mould to be made therein, and its inſide lined with walls of free-ſtone or brick. At the bottom is made a hole of the ſame materials, with a kind of furnace, having its aperture outwards: in this is a fire made to dry the mould, and afterwards melt the wax. Over this furnace is placed the grate, and upon this the mould, &c. formed as above. Laſtly, At one of the edges of the ſquare pit, is made another large furnace to melt the metal. In the other way, it is ſufficient to work the mould above ground, but with the like precaution of a furnace and grate underneath. When finiſhed, four walls are to be run around it, and by the ſide thereof a maſſive made for a melting furnace. For the reſt, the method is the ſame in both. The mould being finiſhed, and encloſed as deſcribed, whether under ground or above it, a moderate fire is lighted in the furnace under it, and the whole covered with planks, that the wax may melt gently down, and run out at pipes contrived for that purpoſe, at the foot of the mould, which are afterwards exactly cloſed with earth, ſo ſoon as the wax is carried off. This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace augmented, till ſuch time as both the bricks and mould become red hot. After this, the fire being extinguiſhed, and every thing cold again,

Foundery. they take out the bricks, and fill up their place with earth moiſtened, and a little beaten to the top of the mould, in order to make it the more firm and ſteady. Theſe preparatory meaſures being duly taken, there remains nothing but to melt the metal, and run it into the mould. This is the office of the furnace above deſcribed, which is commonly made in the form of an oven with three apertures, one to put in the wood, another for a vent, and a third to run the metal out at. From this laſt aperture, which is kept very cloſe while the metal is in fuſion, a ſmall tube is laid, whereby the melted metal is conveyed into a large earthen baſon, over the mould, into the bottom of which all the big branches of the jets, or caſts, which are to convey the metal into all the parts of the mould, are inſerted.

Theſe caſts or jets are all terminated with a kind of plugs, which are kept cloſe, that, upon opening the furnace, the braſs, which guſhes out with violence, may not enter any of them, till the baſon be full enough of matter to run into them all at once. Upon which occaſion they pull out the plugs, which are long iron rods with a head at one end, capable of filling the whole diameter of each tube. The whole of the furnace is opened with a long piece of iron fitted at the end of each pole, and the mould filled in an inſtant. This completes the work in relation to the caſting part; the reſt being the ſculptor's or carver's buſineſs, who, taking the figure out of the mould and earth wherewith it is encompaſſed, ſaws off the jets with which it appears covered over, and repairs it with chiſſels, gravers, puncheons, &c.

FOUNDERY of Bells. The metal, it is to be obſerved, is different for bells from what it is for ſtatues; there being no tin in the ſtatue metal; but there is a fifth, and ſometimes more, in the bell metal.

The dimenſions of the core and the wax for bells, if a chime of bells eſpecially, are not left to chance, but muſt be meaſured on a ſcale, or diapaſon, which gives the height, aperture, and thickneſs, neceſſary for the ſeveral tones required.

It is on the wax that the ſeveral mouldings and other ornaments and inſcriptions, to be repreſented in relievo on the outſide of the bell, are formed. The clapper or tongue is not properly a part of the bell, but is furniſhed from other hands. In Europe, it is uſually of iron, with a large knob at the extreme; and is ſuſpended in the middle of the bell. In China, it is only a huge wooden mallet, ſtruck by force of arm againſt the bell; whence they can have but little of that conſonancy ſo much admired in ſome of our chimes of bells. The Chineſe have an extraordinary way of increaſing the ſound of their bells, viz. by leaving a hole under the cannon; which our bell-founders would reckon a defect.

The proportions of our bells differ very much from thoſe of the Chineſe. In ours, the modern proportions are, to make the diameter 15 times the thickneſs of the brim, and the height 12 times. The parts of a bell are, 1. The ſounding bow, terminated by an inferior circle, which grows thinner and thinner. 2. The brim or that part of a bell whereon the clapper ſtrikes, and which is thicker than the reſt. 3. The outward ſinking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waiſt or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vaſe, or that part which is above the waiſt. 6. The pallet which ſupports the ſtaple of the clapper within. 7. The bent and hollowed branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam, which is its ſupport and counterpoiſe when rung out. Foundery.

The buſineſs of bell foundery is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. The melting of the metal. There are two kinds of proportions, viz. the ſimple and the relative; the former are thoſe proportions only that are between the ſeveral parts of a bell to render it ſonorous; the relative proportions eſtabliſh a requiſite harmony between ſeveral bells.

The method of forming the profile of a bell, previous to its being caſt, in which the proportion of the ſeveral parts may be ſeen, is as follows: the thickneſs of the brim, C 1 (Plate CCXXIII.) is the foundation of every other meaſure, and is divided into three equal parts. Firſt, draw the line HD, which repreſents the diameter of the bell; biſect it in F and erect the perpendicular F*f*; let DF and HF be alſo biſected in E and G, and two other perpendiculars E*e*, G*a*, be erected at E and G: GE will be the diameter of the top or upper vaſe, i. e. the diameter of the top will be half that of the bell; and it will, therefore, be the diameter of a bell which will ſound an octave to the other. Divide the diameter of the bell or the line HD into 15 equal parts, and one of theſe will give C 1 the thickneſs of the brim; divide again each of theſe 15 equal parts into three other equal parts, and then form a ſcale. From this ſcale take 12 of the larger diviſions or $\frac{2}{15}$ of the whole ſcale in the compaſs, and ſetting one leg in D deſcribe an arc to cut the line E*e* in N; draw ND, and divide this line into 12 equal parts; at the point 1 erect the perpendicular 1 C=10, and C 1 will be the thickneſs of the brim $=\frac{1}{15}$ of the diameter: draw the line CD; biſect DN; and at the point of biſection erect the perpendicular 6 K=1$\frac{1}{2}$ of the larger diviſions on the ſcale. With an opening of the compaſs equal to twice the length of the ſcale or 30 brims, ſetting one leg in N, deſcribe an arc of a circle, and with the ſame leg in K and the ſame opening deſcribe another arc to interſect the former: on this point of interſection as a centre, and with a radius equal to 30 brims, deſcribe the arc NK; in 6 K produced take KB=$\frac{1}{4}$ of the larger meaſure of the ſcale or $\frac{1}{4}$ of the brim, and on the ſame centre with the radius 30$\frac{1}{4}$ brims deſcribe an arc AB parallel to NK. For the arc BC, take 12 diviſions of the ſcale or 12 brims in the compaſs; find a centre, and from that centre, with this opening, deſcribe the arc BC, in the ſame manner as NK or AB were deſcribed. There are various ways of deſcribing the arc K*p*; ſome deſcribe it on a centre at the diſtance of nine brims from the points *p* and K; others, as it is done in the figure, on a centre at the diſtance only of ſeven brims from thoſe points. But it is neceſſary firſt to find the point *p*, and to determine the rounding of the Plate CCXXIII.

Foundery. the bell *p* 1. For this purpoſe, on the point C as a centre, and with the radius C 1, deſcribe the arc 1 *p n*; biſect the part 1, 2 of the line D*n*, and erecting the perpendicular *pm*, this perpendicular will cut the arc 1 *pn* in *m*, which terminates the rounding 1 *p*. Some founders make the bendings K a third of a brim lower than the middle of the line DN; others make the part C 1 D more acute, and inſtead of making C 1 perpendicular to DN at 1, draw it $\frac{1}{6}$th of a brim higher, making it ſtill equal to one brim; ſo that the line 1 D is longer than the brim C 1. In order to trace out the top part N *a*, take in the compaſs eight diviſions of the ſcale or eight brims, and on the points N and D as centres, deſcribe arcs to interſect each other in 8: on this point 8, with a radius of eight brims, deſcribe the arc N *b*; this arc will be the exterior curve of the top or crown: on the ſame point 8 as a centre, and with a radius equal to $7\frac{1}{3}$ brims, deſcribe the arc A *e*, and this will be the interior curve of the crown, and its whole thickneſs will be one-third of the brim. As the point 8 does not fall in the axis of the bell, a centre M may be found in the axis by deſcribing, with the interval of eight brims on the centres D and H, arcs which will interſect in M; and this point may be made the centre of the inner and outer curves of the crown as before. The thickneſs of the cap which ſtrengthens the crown at Q is about one-third of the thickneſs of the brim; and the hollow branches or ears about one-ſixth of the diameter of the bell. The height of the bell in proportion to its diameter as 12 to 15, or in the proportion of the fundamental ſound to its third major: whence it follows, that the ſound of a bell is principally compoſed of the ſound of its extremity or brim as a fundamental, of the ſound of the crown which is an octave to it, and of that of the height which is a third.

The particulars neceſſary for making the mould of a bell are, 1. The earth: the moſt coheſive is the beſt; it muſt be well ground and ſifted, to prevent any chinks. 2. Brick ſtone; which muſt be uſed for the mine, mould, or core, and for the furnace. 3. Horſe dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inſcriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a ſlight lay of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, they have a ſcaffold conſiſting of four boards ranged upon treſſels. Upon this they carry the earth, groſsly diluted, to mix it with horſe dung, beating the whole with a large ſpatula.

The compaſſes of conſtruction is the chief inſtrument for making the mould, which conſiſt of two different legs joined by a third piece. And laſt of all the founders ſhelves, on which are the engravings of the letters, cartridges, coats of arms, &c.

They firſt dig a hole of a ſufficient depth to contain the mould of the bell, together with the caſe or cannon under ground; and about ſix inches lower than the terreplain, where the work is performed. The hole muſt be wide enough for a free paſſage between the mould and walls of the hole, or between one mould and another, when ſeveral bells are to be caſt. At the centre of the hole is a ſtake erected, that is ſtrongly Foundery. faſtened in the ground. This ſupports an iron peg, on which the pivot of the ſecond branch of the compaſſes turns. The ſtake is encompaſſed with a ſolid brick-work, perfectly round, about half a foot high, and of the propoſed bell's diameter. This they call a *mill-ſtone*. The parts of the mould are, the core, the model of the bell, and the ſhell. When the outer ſurface of the core is formed, they begin to raiſe the core, which is made of bricks that are laid in courſes of equal height upon a lay of plain earth. At the laying of each brick, they bring near it the branch of the compaſſes on which the curve of the core is ſhaped, ſo as that there may remain between it and the curve the diſtance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement, made of earth and horſe dung; on which they move the compaſſes of conſtruction, to make it of an even ſmoothneſs everywhere.

The firſt layer being finiſhed, they put the fire to the core, by filling it half with coals, through an opening that is kept ſhut, during the baking, with a cake of earth that has been ſeparately baked. The firſt fire conſumes the ſtake, and the fire is left in the core half or ſometimes a whole day: the firſt layer being thoroughly dry, they cover it with a ſecond, third, and fourth; each being ſmoothed by the board of the compaſſes, and thoroughly dried before they proceed to another.

The core being completed, they take the compaſſes to pieces, with intent to cut off the thickneſs of the model, and the compaſſes are immediately put in their place to begin a ſecond piece of the mould. It conſiſts of a mixture of earth and hair, applied with the hand on the core, in ſeveral cakes that cloſe together. This work is finiſhed by ſeveral layers of a thinner cement of the ſame matter, ſmoothed by the compaſſes, and thoroughly dried before another is laid on. The firſt layer of the model is a mixture of wax and greaſe ſpread over the whole. After which are applied the inſcriptions, coats of arms, &c. beſmeared with a pencil dipped in a veſſel of wax in a chafing diſh: this is done for every letter. Before the ſhell is begun, the compaſſes are taken to pieces, to cut off all the wood that fills the place of the thickneſs to be given to the ſhell.

The firſt layer is the ſame earth with the reſt, ſifted very fine: while it is tempering in water, it is mixed with cows hair to make it cohere. The whole being a thin cullis, is gently poured on the model, that fills exactly all the ſinuoſities of the figures, &c. and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a ſecond of the ſame matter, but ſomewhat thicker; when this ſecond layer becomes of ſome conſiſtence, they apply the compaſſes again, and light a fire in the core, ſo as to melt off the wax of the inſcriptions, &c.

After this, they go on with other layers of the ſhell, by means of the compaſſes. Here they add to the cows hair a quantity of hemp, ſpread upon the layers, and afterwards ſmoothed by the board of the com-

Foundery. paſſes. The thickneſs of the ſhell comes to four or five inches lower than the millſtone before obſerved, and ſurrounds it quite cloſe, which prevents the extravaſation of the metal. The wax ſhould be taken out before the melting of the metal.

The ear of the bell requires a ſeparate work, which is done during the drying of the ſeveral incruſtations of the cement. It has ſeven rings: the ſeventh is called the *bridge*, and unites the others, being a perpendicular ſupport to ſtrengthen the curves. It has an aperture at the top, to admit a large iron peg, bent at the bottom; and this is introduced into two holes in the beam, faſtened with two ſtrong iron keys. There are models made of the rings, with maſſes of beaten earth, that are died in the fire in order to have the hollow of them. Theſe rings are gently preſſed upon a layer of earth and cows hair, one half of its depth; and then taken out, without breaking the mould. This operation is repeated 12 times for 12 half moulds, that two and two united may make the hollows of the ſix rings: the ſame they do for the hollow of the bridge, and bake them all to unite them together.

Upon the open place left for the coals to be put in are placed the rings that conſtitute the ear. They firſt put into this open place the iron ring to ſupport the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickneſs of the core. This cake, after baking, is clapt upon the opening, and ſoldered with a thin mortar ſpread over it, which binds the cover cloſe to the core.

The hollow of the model is filled with an earth, ſufficiently moiſt to fix on the place, which is ſtrewed at ſeveral times upon the cover of the core; and they beat it gently with a peſtle, to a proper height; and a workman ſmooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they aſſemble the hollows of the rings. When every thing is in its proper place, they ſtrengthen the outſide of the hollows with mortar, in order to bind them with the bridge, and keep them ſteady at the bottom, by means of a cake of the ſame mortar, which fills up the whole aperture of the ſhell. This they let dry, that it may be removed without breaking. To make room for the metal, they pull off the hollows of the rings, through which the metal is to paſs, before it enters into the vacuity of the mould. The ſhell being unloaded of its ear, they range under the millſtone five or ſix pieces of wood, about two feet long, and thick enough to reach almoſt the lower part of the ſhell; between theſe and the mould, they drive in wooden wedges with a mallet, to ſhake the ſhell of the model whereon it reſts, ſo as to be pulled up and got out of the pit.

When this and the wax are removed, they break the model and the layer of earth, through which the metal muſt run, from the hollow of the rings, between the ſhell and the core. They ſmoke the inſide of the ſhell, by burning ſtraw under it, that helps to ſmooth the ſurface of the bell. Then they put the ſhell in the place, ſo as to leave the ſame interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a maſs of baked cement. After which they put on this maſs of the cap, the rings, and the vent, over the ſhell, and Foundery. ſolder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it ſtrongly all the time round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney with a ſpacious aſh-hole. The furnace which contains the metal is vaulted, whoſe bottom is made of earth, rammed down; the reſt is built with brick. It has four apertures; the firſt, through which the flame revibrates; the ſecond is cloſed with a ſtopple that is opened for the metal to run; the others are to ſeparate the droſs or ſcoriæ of the metal by wooden rakes: through theſe laſt apertures paſſes the thick ſmoke. The ground of the furnace is built ſloping, for the metal to run down.

FOUNDERY of Great Guns and Mortar Pieces. The method of caſting theſe pieces is little different from that of bells; they are run maſſy, without any core, being determined by the hollow of the ſhell; and they are afterwards bored with a ſteel trepan, that is worked either by horſes or a water-mill.

For the metal, parts, proportions, &c. of theſe pieces, ſee GUNNERY.

Letter FOUNDERY, or *Caſting of Printing Letters.*

In the buſineſs of cutting, caſting, &c. letters for printing, the letter-cutter muſt be provided with a vice, hand-vice, hammers, and files of all ſorts for watch-makers uſe; as alſo gravers and ſculpters of all ſorts, and an oil-ſtone, &c. ſuitable and ſizeable to the ſeveral letters to be cut: a flat gage made of box to hold a rod of ſteel, or the body of a mould, &c. exactly perpendicular to the flat of the uſing file: a ſliding gage, whoſe uſe is to meaſure and ſet off diſtances between the ſhoulder and the tooth, and to mark it off from the end, or from the edge of the work; a face gage, which is a ſquare notch cut with a file into the edge of a thin plate of ſteel, iron, or braſs, of the thickneſs of a piece of common tin, whoſe uſe is to proportion the face of each ſort of letter, viz. long letters, aſcending letters, and ſhort letters. So there muſt be three gages; and the gage for the long letters is the length of the whole body ſuppoſed to be divided into 42 equal parts. The gage for the aſcending letters Roman and Italic are, $\frac{5}{7}$ or 30 parts of 42, and 33 parts for the Engliſh face. The gage for the ſhort letters is $\frac{3}{7}$, or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the Engliſh face.

The Italic and other ſtanding gages are to meaſure the ſcope of the Italic ſtems, by applying the top and bottom of the gage to the top and bottom lines of the letters, and the other ſide of the gage to the ſtem; for when the letter complies with theſe three ſides of the gage, that letter has its true ſhape.

The next care of the letter-cutter is to prepare good ſteel punches, well tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact ſhape of the letter with pen and ink if the letter be large, or with a ſmooth blunted point of a needle if it be ſmall; and then with ſizeable and proper ſhaped and pointed gravers and ſculpters, digs or ſculps out the ſteel between the ſtrokes or marks he made on the face of the punch, and leaves the marks ſtanding

Foundery. ſtanding on the face. Having well ſhaped the inſide ſtrokes of his letter, he deepens the hollows with the ſame tools; for if a letter be not deep in proportion to its width, it will, when uſed at preſs, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outſide with proper files till it be fit for the matrice.

But before we proceed to the ſinking and juſtifying of the matrices, we muſt provide a mould to juſtify them by, of which there is a draught in Plate CCXXIII. fig. 1. 2.

Plate CCXXIII. fig. 1. & 2.

Every mould is compoſed of an upper and an under part. The under part is delineated in fig. 1. The upper part is marked fig. 2. and is in all reſpects made like the under part, excepting the ſtool behind, and the bow or ſpring alſo behind; and excepting a ſmall roundiſh wire between the body and carriage, near the break, where the under part hath a ſmall rounding groove made in the body. This wire, or rather half wire, in the upper part makes the nick in the ſhank of the letter, when part of it is received into the groove in the under part. Theſe two parts are ſo exactly fitted and gaged into one another (viz. the male gage marked *c* in fig. 2. into the female marked *g* in fig. 1.), that when the upper part of the mould is properly placed on, and in the under part of the mould, both together make the entire mould, and may be ſlid backwards for uſe ſo far, till the edge of either of the bodies on the middle of either carriage comes juſt to the edge of the female gages cut in each carriage; and they may be ſlid forward ſo far, till the bodies on either carriage touch each other: and the ſliding of theſe two parts of the mould backwards makes the ſhank of the letter thicker, becauſe the bodies on each part ſtand wider aſunder; and the ſliding them forwards makes the ſhank of the letter thinner, becauſe the bodies on each part of the mould ſtand cloſer together. The parts of the mould are as follow: viz. a, The carriage. b, The body. c, The male gage. d e, The mouth-piece. f i, The regiſter. g, The female gage. h, The hag, *a a a a*, The bottom-plate. *b b b*, The wood on which the bottom-plate lies. *c c c*, The mouth. *d d*, The throat. *e d d*, The pallat. *f*, The nick. *g g*, The ſtool. *h h*, The ſpring or bow.

Then the mould muſt be juſtified: and firſt the founder juſtifies the body, by caſting about 20 proofs or ſamples of letters; which are ſet up in a compoſing ſtick, with all their nicks towards the right hand; and then by comparing theſe with the pattern letters, ſet up in the ſame manner, he finds the exact meaſure of the body to be caſt. He alſo tries if the two ſides of the body are parallel, or that the body be no bigger at the head than at the foot, by taking half the number of his proofs and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two ſides may be pronounced parallel. He farther tries whether the two ſides of the thickneſs of the letter be parallel, by firſt ſetting his proofs in the compoſing ſtick with their nicks upwards, and then turning one-half with their heads to the feet of the other half; and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two ſides of the thickneſs are parallel. Foundery.

The mould thus juſtified, the next buſineſs is to prepare the matrices. A matrice is a piece of braſs or copper of about an inch and a half long, and of thickneſs in proportion to the ſize of the letter it is to contain. In this metal is ſunk the face of the letter intended to be caſt, by ſtriking the letter punch about the depth of an n. After this the ſides and face of the matrice muſt be juſtified and cleared with files of all bunchings made by ſinking the punch.

Every thing thus prepared, it is brought to the furnace; which is built of brick upright, with four ſquare ſides, and a ſtone on the top, in which ſtone is a wide round hole for the pan to ſtand in. A foundery of any conſequence has ſeveral of theſe furnaces in it.

As to the metal of which the types are to be caſt, this, in extenſive founderies, is always prepared in large quantities; but caſt into ſmall bars, of about 20 pounds weight, to be delivered out to the workmen as occaſion requires. In the letter foundery which has been long carried on with reputation under the direction of Meſſ. Wilſon and Sons at Glaſgow, we are informed, that a ſtock of metal is made up at two different times of the year, ſufficient to ſerve the caſters at the furnace for ſix months each time. For this purpoſe, a large furnace is built under a ſhade, furniſhed with a wheel vent, in order the more equally to heat the ſides of a ſtrong pot of caſt iron, which holds when full 15 hundred weight of the metal. The fire being kindled below, the bars of lead are let ſoftly down into the pot, and their fuſion promoted by throwing in ſome pitch and tallow, which ſoon inflame. An outer chimney, which is built ſo as to project about a foot over the fartheſt lip of the pot, catches hold of the flame by a ſtrong draught, and makes it act very powerfully in melting lead; whilſt it ſerves at the ſame time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the buſineſs is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and ſome more tallow inflamed to make the whole incorporate ſooner. The workmen now having mixed the contents of the pot very thoroughly by ſtirring long with a large iron ladle, next proceed to draw the metal off into the ſmall troughs of caſt iron, which are ranged to the number of fourſcore upon a level platform, faced with ſtone, built towards the right hand. In the courſe of a day 15 hundred weight of metal can be eaſily prepared in this manner; and the operation is continued for as many days as are neceſſary to prepare a ſtock of metal of all the various degrees of hardneſs. After this, the whole is diſpoſed into preſſes according to its quality, to be delivered out occaſionally to the workmen.

The founder muſt now be provided with a ladle, which differs nothing from other iron ladles but in its ſize; and he is provided always with ladles of ſeveral ſizes, which he uſes according to the ſize of the letters he is to caſt. Before the caſter begins to caſt, he muſt kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the ſtone, and there lays in coals and kindles them; and, when they are well kindled, he ſets the pan in again,

Foundery. again, and puts in metal into it to melt; if it be a ſmall-bodied letter he caſts, or a thin letter of great bodies, his ladle muſt be very hot, nay ſometimes red hot, to make the letter come. Then having choſen a ladle that will hold about ſo much as the letter and break is, he lays it at the ſtoking hole, where the flame burſts out, to heat. Then he ties a thin leather, cut with its narrow end againſt the face to the leather groove of the matrice, by whipping a brown thread twice about the leather groove, and faſtening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the ſtool of the mould, and the broad end of the leather upon the wood of the upper half of the mould, but not tight up, leſt it might hinder the foot of the matrice from ſinking cloſe down upon the ſtool in a train of work. Then laying a little roſin on the upper wood of the mould, and having his caſting ladle hot, he with the boiling ſide of it melts the roſin: and, when it is yet melted, preſſes the broad end of the leather hard down on the wood, and ſo faſtens it to the wood; all this is the preparation.

Now he comes to caſting. Wherefore, placing the under half of the mould in his left hand, with the hook or hag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind fingers; then he lays the upper half of the mould upon the under half, ſo that the male gages may fall into the female gages, and at the ſame time the foot of the matrice places itſelf upon the ſtool; and, elaſping his left hand thumb ſtrong over the upper half of the mould, he nimbly catches hold of the bow or ſpring with his right hand fingers at the top of it, and his thumb under it, and places the point of it againſt the middle of the notch in the backſide of the matrice, preſſing it as well forwards towards the mould, as downwards by the ſhoulder of the notch cloſe upon the ſtool, while at the ſame time with his hinder fingers, as aforeſaid, he draws the under half of the mould towards the ball of his thumb, and thruſts by the ball of his thumb the upper part towards his fingers, that both the regiſters of the mould may preſs againſt both ſides of the matrice, and his thumb and fingers preſs both halves of the mould cloſe together.

Then he takes the handle of his ladle in his right hand, and with the boll of it gives a ſtroke, two or three, outwards upon the ſurface of the melted metal, to ſeum or clear it from the film or duſt that may ſwim upon it; then takes up the ladle full of metal, and having his mould, as aforeſaid, in his left hand, he a little twiſts the left ſide of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twiſts the upper part of his right hand towards him to turn the metal into it, while at the ſame moment of time he jilts the mould in his left hand forwards, to receive the metal with a ſtrong ſhake (as it is called), not only into the body of the mould, but while the metal is yet hot running, ſwift and ſtrongly, into the very face of the matrice, to receive its perfect form there, as well as in the ſhank.

Then he takes the upper half of the mould off the under half, by placing his right hand thumb on the end of the wood next his left hand thumb, and his two middle fingers at the other end of the wood; and Foundery. finding the letter and break lie in the under half of the mould (as moſt commonly by reaſon of its weight it does), he throws or toſſes the letter, break and all, upon a ſheet of waſte paper laid for that purpoſe on the bench, juſt a little beyond his left hand, and is then ready to caſt another letter as before; and alſo, the whole number that is to be caſt with that matrice. A workman will ordinarily caſt about 3000 of theſe letters in a day.

When the caſters at the furnace have got a ſufficient number of types upon the tables, a ſet of boys come and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who paſs them ſwiftly under their fingers, defended by leather, upon ſmooth flat ſtones, in order to poliſh their broadſides. This is a very dexterous operation, and is a remarkable inſtance of what may be effected by the power of habit and long practice; for theſe boys, in turning up the other ſide of the type, do it ſo quickly by a mere touch of the fingers of the left hand, as not to require the leaſt perceptible intermiſſion in the motion of the right hand upon the ſtones. The types, thus finely ſmoothed and flattened on the broad ſides, are next carried to another ſet of boys, who ſit at a ſquare table, two on each ſide, and there are ranged upon long rulers or ſticks, fitted with a ſmall projection, to hinder them from ſliding off backwards. When theſe ſticks are ſo filled, they are placed, two and two, upon a ſet of wooden pins fixed into the wall, near the dreſſer, ſometimes to the amount of an hundred, in order to undergo the finiſhing operations. This workman, who is always the moſt expert and ſkilful in all the different branches carried on at the foundery, begins by taking one of theſe ſticks, and, with a peculiar addreſs, ſlides the whole column of types off upon the dreſſing-ſtick: this is made of well-ſeaſoned mahogany, and furniſhed with two end-pieces of ſteel, a little lower than the body of the types, one of which is moveable, ſo as to approach the other by means of a long ſcrew-pin, inſerted in the end of the ſtick. The types are put into the ſtick with their faces next to the back or projection; and after they are adjuſted to one another ſo as to ſtand even, they are then bound up, by ſcrewing home the moveable end-piece. It is here where the great and requiſite accuracy of the moulds comes to be perceived; for in this caſe the whole column, ſo bound up, lies flat and true upon the ſtick, the two extreme types being quite parallel, and the whole has the appearance of one ſolid continuous plate of metal. The leaſt inaccuracy in the exact parallelifm of the individual type, when multiplied ſo many times, would render it impoſſible to bind them up in this manner, by diſpoſing them to riſe or ſpring from the ſtick by the ſmalleſt preſſure from the ſcrew. Now, when lying ſo conveniently with the narrow edges uppermoſt, which cannot poſſibly be ſmoothed in the manner before mentioned by the ſtones, the workmen does this more effectually by ſcraping the ſurface of the column with a thick-edged but ſharp razor, which at every ſtroke brings on a very fine ſmooth ſkin, like to poliſhed ſilver: and thus he proceeds till in about half a minute he comes to the farther end of the ſtick. The other edges of

Foundery, Fount.

of the types are next turned upwards, and poliſhed in the ſame manner. It is whilſt the types thus lie in the dreſſing-ſtick that the operation of bearding or barbing is performed, which is effected by running a plane, faced with ſteel, along the ſhoulder of the body next to the face, which takes more or leſs off the corner, as occaſion may require. Whilſt in the dreſſing-ſtick, they are alſo grooved, which is a very material operation. In order to underſtand this, it muſt be remembered, that when the types are firſt broken off from the jets, ſome ſuperfluous metal always remains, which would make them bear very unequally againſt the paper whilſt under the printing preſs, and effectually mar the impreſſion. That all theſe inequalities may, therefore, be taken away, and that the bearings of every type may be regulated by the ſhoulders imparted to them all alike from the mould, the workman or dreſſer proceeds in the following manner: The types being ſcrewed up in the ſtick, as before mentioned, with the jet end outermoſt, and projecting beyond the wood about one-eighth of an inch, the ſtick is put into an open preſs, ſo as to preſent the jet end uppermoſt, and then every thing is made faſt by driving a long wedge, which bears upon a ſlip of wood, which lies cloſe to the types the whole length: then a plough or plane is applied, which is ſo conſtructed as to embrace the projecting part of the types betwixt its long ſides, which are made of poliſhed iron. When the plane is thus applied, the ſteel cutter bearing upon that part between the ſhoulders of the types, where the inequalities lie, the dreſſer dexterouſly glides it along, and by this means ſtrips off every irregular part that comes in the way, and ſo makes an uniform groove the whole length, and leaves the two ſhoulders ſtanding; by which means every type becomes preciſely like to another, as to the height againſt paper. The types being now finiſhed, the ſtick is taken out of the preſs, and the whole column replaced upon the other ſtick; and after the whole are ſo dreſſed, he proceeds to pick out the bad letters, previous to putting them up into pages and papers. In doing this he takes the ſtick into his left hand, and turning the faces near to the light, he examines them carefully, and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a ſharp bodkin, which he holds in the right hand for that purpoſe. Thoſe letters which, from their form, project over the body of the type, and which cannot on this account be rubbed on the ſtones, are ſcraped on the broadſides with a knife or file, and ſome of the metal next the face pared away with a pen-knife, in order to allow the type to come cloſe to any other. This operation is called *kerning*.

The excellence of printing types conſiſts not only in the due performance of all the operations above deſcribed, but alſo in the hardneſs of the metal, form, and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

FOUNT, or FONT, among printers, &c. a ſet or quantity of characters or letters of each kind, caſt by a letter-founder, and ſorted.—We ſay, a founder has caſt a fount of pica, of engliſh, of pearl, &c. meaning that he has caſt a ſet of characters of theſe kinds.

A complete fount not only includes the running letters, but alſo large and ſmall capitals, ſingle letters, double letters, points, commas, lines, and numeral characters.

Fount, Fountain.

Founts are large or ſmall, according to the demand of the printer, who orders them by the hundred weight, or by ſheets. When the printer orders a fount of 500, he means that the fount ſhould weigh 500lb. When he demands a fount of 10 ſheets, it is underſtood, that with that fount he ſhall be able to compoſe 10 ſheets, or 20 forms, without being obliged to diſtribute. The founder takes his meaſures accordingly; he reckons 120 pounds for a ſheet, including the quadrates, &c. or 60 pounds for a form, which is half a ſheet: not that the ſheet always weighs 120 pounds, or the form 60 pounds; on the contrary, it varies according to the ſize of the form; beſides, it is always ſuppoſed that there are letters left in the caſes.

The letter-founders have a kind of liſt, or tariff, whereby they regulate their founts: the occaſion thereof is, that ſome letters being in much more uſe, and oftener repeated than others, their cells or caſes ſhould be better filled and ſtored than thoſe of the letters which do not return ſo frequently. Thus the *o* and *i*, for inſtance, are always in greater quantity than the *k* or *z*.

This difference will be beſt perceived from a proportional compariſon of thoſe letters with themſelves, or ſome others. Suppoſe a fount of 100,000 characters, which is a common fount; here the *a* ſhould have 5000, the *c* 3000, the *e* 11,000, the *i* 6000, the *m* 3000, the *k* only 30, and the *x*, *y* and *z*, not many more. But this is only to be underſtood of the letters of the lower caſe; thoſe of the upper having other proportions, which it would be, here, too long to inſiſt on.

FOUNTAIN, a ſpring or ſource of water riſing out of the earth. Among the ancients, fountains were generally eſteemed as ſacred; but ſome were held to be ſo in a more particular manner. The good effects received from cold baths gave ſprings and rivers this high reputation; for their ſalutary influence was ſuppoſed to proceed from ſome preſiding deity. Particular reaſons might occaſion ſome to be held in greater veneration than others. It was cuſtomary to throw little pieces of money into thoſe ſprings, lakes, or rivers, which were eſteemed ſacred, to render the preſiding divinities propitious; as the touch of a naked body was ſuppoſed to pollute their hallowed waters. For the phenomena, theory, and origin of fountains or ſprings, ſee SPRING.

Artificial FOUNTAIN, called alſo a *jet d'eau*, is a contrivance by which water is violently ſpouted upwards. See HYDRODYNAMICS.

Boiling FOUNTAIN. See ICELAND.

FOUNTAIN-*Tree*, a very extraordinary vegetable growing in one of the Canary iſlands, and likewiſe ſaid to exiſt in ſome other places, which diſtils water from its leaves in ſuch plenty as to anſwer all the purpoſes of the inhabitants who live near it. Of this tree we have the following account in Glaſſe's hiſtory of the Canary iſlands.—"There are only three fountains of water in the whole iſland of Hierro, wherein the fountain-tree grows. One of theſe fountains is called *Acof*, which, in the language of the ancient inhabitants, ſignifies *river*; a name, however, which does not ſeem

to

Fountain. to have been given it on account of its yielding much water, for in that reſpect it hardly deſerves the name of a fountain. More to the northward is another called *Hapio;* and in the middle of the iſland is a ſpring, yielding a ſtream about the thickneſs of a man's finger. This laſt was diſcovered in the year 1565, and is called the *fountain of Anton. Hernadez.* On account of the ſcarcity of water, the ſheep, goats, and ſwine, here do not drink in the ſummer, but are taught to dig up the roots of fern, and chew them to quench their thirſt. The great cattle are watered at thoſe fountains, and at a place where water diſtils from the leaves of a tree. Many writers have made mention of this famous tree, ſome in ſuch a manner as to make it appear miraculous: others again deny the exiſtence of any ſuch tree: among whom is Father Feyjoo, a modern Spaniſh author, in his Theatro Critico. But he, and thoſe who agree with him in this matter, are as much miſtaken as thoſe who would make it appear to be miraculous. This is the only iſland of all the Canaries which I have not been in; but I have ſailed with natives of Hierro, who, when queſtioned about the exiſtence of this tree, anſwered in the affirmative.

"The author of the *Hiſtory of the diſcovery and conqueſt* has given us a particular account of it, which I ſhall here relate at large.

"The diſtrict in which this tree ſtands is called *Tigulahe;* near to which, and in the cliff or ſteep rocky aſcent that ſurrounds the whole iſland, is a narrow gutter or gully, which commences at the ſea, and continues to the ſummit of the cliff, where it joins or coincides with a valley, which is terminated by the ſteep front of a rock. On the top of this rock grows a tree, called in the language of the ancient inhabitants, *Garſe*, "Sacred or Holy Tree," which for many years has been preſerved ſound, entire, and freſh. Its leaves conſtantly diſtil ſuch a quantity of water as is ſufficient to furniſh drink to every living creature in Hierro; nature having provided this remedy for the drought of the iſland. It is ſituated about a league and a half from the ſea. It is not certainly known of what ſpecies it is, only that it is called *Til.* It is diſtinct from other trees, and ſtands by itſelf; the circumference of the trunk is about 12 ſpans, the diameter four, and in height, from the ground to the top of the higheſt branch, 40 ſpans: the circumference of all the branches together is 120 feet. The branches are thick and extended; the loweſt commence about the height of an ell from the ground. Its fruit reſembles the acorn, and taſtes ſomething like the kernel of a pine apple, but is ſofter and more aromatic. The leaves of this tree reſemble thoſe of the laurel, but are larger, wider, and more curved; they come forth, in a perpetual ſucceſſion, ſo that the tree always remains green. Near to it grows a thorn which it faſtens on many of its branches, and interweaves with them; and at a ſmall diſtance from the garſe are ſome beech trees, breſos, and thorns. On the north ſide of the trunk are two large tanks or ciſterns, of rough ſtone, or rather one ciſtern divided, each half being 20 feet ſquare, and 16 ſpans in depth. One of theſe contains water for the drinking of the inhabitants: and the other that which they uſe for their cattle, waſhing, and ſuch like purpoſes. Every morning, near this part of the iſland, a cloud or miſt ariſes from the ſea, which the ſouth and eaſterly winds force againſt the fore-mentioned ſteep cliff; ſo that the cloud Fountain. having no vent but by the gutter, gradually aſcends it, and from thence advances ſlowly to the extremity of the valley, where it is ſtopped and checked by the front of the rock which terminates the valley, and then reſts upon the thick leaves and wide-ſpreading branches of the tree, from whence it diſtils in drops during the remainder of the day, until it is at length exhauſted, in the ſame manner that we ſee water drip from the leaves of trees after a heavy ſhower of rain. This diſtillation is not peculiar to the garſe or til; for the breſos, which grow near it, likewiſe drop water; but their leaves being but few and narrow, the quantity is ſo trifling, that though the natives ſave ſome of it, yet they make little or no account of any but what diſtils from the til, which, together with the water of ſome fountains, and what is ſaved in the winter ſeaſon, is ſufficient to ſerve them and their flocks. This tree yields moſt water in thoſe years when the Levant or eaſterly winds have prevailed for a continuance; for, by theſe winds only the clouds or miſts are drawn hither from the ſea. A perſon lives on the ſpot near which this tree grows, who is appointed by the council to take care of it and its water; and is allowed a houſe to live in, with a certain ſalary. He every day diſtributes to each family of the diſtrict ſeven pots or veſſels full of water, beſides what he gives to the principal people of the iſland."

"Whether the tree which yields water at this preſent time be the ſame as that mentioned in the above deſcription, I cannot pretend to determine: but it is probable there has been a ſucceſſion of them; for Pliny, deſcribing the Fortunate iſlands, ſays, "In the mountains of Ombrion are trees reſembling the plant ferula, from which water may be procured by preſſure. What comes from the black kind is bitter, but that which the white yields is ſweet and potable."

Trees yielding water are not peculiar to the iſland of Hierro; for travellers inform us of one of the ſame kind in the iſland of St Thomas, in the bight or gulf of Guinea. In Cockburn's voyages we find the following account of a dropping tree, near the mountains of Vera Paz, in America.

"On the morning of the fourth day, we came out on a large plain, where were great numbers of fine deer, and in the middle ſtood a tree of unuſual ſize, ſpreading its branches over a vaſt compaſs of ground. Curioſity led us up to it. We had perceived, at ſome diſtance off, the ground about it to be wet; at which we began to be ſomewhat ſurpriſed, as well knowing there had no rain fallen for near ſix months paſt, according to the certain courſe of the ſeaſon in that latitude: that it was impoſſible to be occaſioned by the fall of dew on the tree, we were convinced, by the ſun's having power to exhale away all moiſture of that nature a few minutes after its riſing. At laſt, to our great amazement as well as joy, we ſaw water dropping, or as it were diſtilling, faſt from the end of every leaf of this wonderful (nor had it been amiſs if I had ſaid *miraculous*) tree; at leaſt it was ſo with reſpect to us, who had been labouring four days through extreme heat, without receiving the leaſt moiſture, and were now almoſt expiring for want of it.

"We could not help looking on this as liquor ſent from heaven to comfort us under great extremity. We

catched

Fountain || Fourneſs.

catched what we could of it in our hands, and drank very plentifully of it; and liked it ſo well, that we could hardly prevail with ourſelves to give over. A matter of this nature could not but incite us to make the ſtricteſt obſervations concerning it; and accordingly we ſtaid under the tree near three hours, and found we could not fathom its body in five times. We obſerved the ſoil where it grew to be very ſtrong; and upon the niceſt inquiry we could afterwards make, both of the natives of the country and the Spaniſh inhabitants, we could not learn there was any ſuch tree known throughout New Spain, nor perhaps all America over: but I do not relate this as a prodigy in nature, becauſe I am not a philoſopher enough to deſcribe any natural cauſe for it; the learned may perhaps give ſubſtantial reaſons in nature for what appeared to us a great and marvellous ſecret."

FOUQUIERES, James, an eminent painter, was born at Antwerp in 1580, and received his chief inſtructions from Velvet Breughel. He applied himſelf to the ſtudy of landſcapes, and went to Italy to improve himſelf in colouring. He ſucceeded ſo happily, that his works are ſaid to be nearly equal to thoſe of Titian. —He was engaged and much careſſed at the court of the elector Palatine, and afterwards ſpent ſeveral years of his life in France; where his works met with univerſal approbation. By ſome miſconduct, however, he ſunk into poverty, and died in 1659, in the houſe of an inconſiderable painter. He had reſided for ſeveral years at Rome and Venice, where he acquired that excellent ſtyle of colouring and deſign for which his works have been deſervedly diſtinguiſhed.

FOURCHEE, or Fourchy, in *Heraldry*, an appellation given to a croſs forked at the end. See Heraldry.

FOURMONT, Stephen, profeſſor of the Arabic and Chineſe languages, and one of the moſt learned men of his time, was born at Herbelai, a village four leagues from Paris, in 1683. He ſtudied in Mazarine college, and afterwards in the Seminary of Thirty-three. He was at length profeſſor of Arabic in the Royal College, and was made a member of the Academy of Inſcriptions. In 1738, he was choſen a member of the Royal Society of London, and of that of Berlin in 1741. He was often conſulted by the duke of Orleans, firſt prince of the blood; who had a particular eſteem for him, and made him one of his ſecretaries. He wrote a great number of books; the moſt conſiderable of thoſe which have been printed are, 1. The Roots of the Latin Tongue, in verſe. 2. Critical Reflections on the Hiſtories of ancient Nations, 2 vols. 4to. 3. *Meditationes Sinicæ*, folio. 4. A Chineſe Grammar, in Latin, folio. 5. Several diſſertations printed in the Memoirs of the Academy of Inſcriptions, &c. He died at Paris in 1744.

He ought not to be confounded with *Michael Fourmont*, his youngeſt brother; who took orders, was profeſſor of the Syriac language in the Royal College, and a member of the Academy of Inſcriptions. He died in 1746.

FOURNESS, in Loynſdale, Lancaſhire, is a tract, between the Kent, Leven, and Dudden-ſands, which runs north parallel with the weſt ſides of Cumberland and Weſtmorland; and on the ſouth runs out into the ſea as a promontory. Here, as Mr Camden expreſſes it, "the ſea, as if enraged at it, laſhes it more furiouſly, and in high tides has even devoured the ſhore, and made three large bays; viz. Kentſand, into which the river Ken empties itſelf; Levenſand and Duddenſand, between which the land projects in ſuch a manner that it has its name hence; Foreneſs and Foreland, ſignifying the ſame with us as *promontorium anterius* in Latin." Biſhop Gibſon, however, derives the name of *Fourneſs* or *Furneſs*, from the numerous furnaces that were there anciently, the rents and ſervices of which (called *Bloomſmithy rents*) are ſtill paid. This whole tract, except on the coaſt, riſes in high hills and vaſt piles of rocks called *Fourneſs-Fells*; among which the Britons found a ſecure retreat, truſting to theſe natural fortreſſes, though nothing was inacceſſible to the victorious Saxons; for we find the Britons ſettled here 228 years after the arrival of the Saxons: becauſe at that time Egfrid king of Northumberland gave St Cuthbert the land called *Carthmell*, and all the Britons in it, as is related in his life. In theſe mountainous parts are found quarries of a fine durable blue ſlate to cover buildings with, which are made uſe of in many other parts of the kingdom. Here are ſeveral cotton mills lately erected; and if fuel for fire were more plentiful, the trade of this country would much increaſe: but there being no coals nearer than Wigan or Whitehaven, and the coaſt duties high, firing is rather ſcarce, the country people uſing only turf or peat, and that begins to be more ſcarce than formerly. In the moſſes of Fourneſs much fir is found, but more oak: the trunks in general lie with their heads to the eaſt, the high winds having been from the weſt. High Furneſs has ever had great quantities of ſheep, which browſe upon the hollies left in great numbers for them; and produces charcoal for melting iron ore, and oak bark for tanners uſe, in great abundance. The foreſts abound with deer and wild boars, and the *legh* or *ſcofe*, or large ſtags, whoſe horns are frequently found under ground here. The low or plain part of Fourneſs, which is ſo called to diſtinguiſh it from the woody or mountainous part, produces all ſorts of grain, but principally oats, whereof the bread eaten in this country is generally made; and there are found here veins of a very rich iron ore, which is not only melted and wrought here, but great quantities are exported to other parts to mix with poorer ores. The three ſands above mentioned are very dangerous to travellers, by the tides and the many quickſands. There is a guide on horſeback appointed to Kent or Lancaſter ſands at 10l. per ann. to Leven at 6l. per ann. out of the public revenue; but to Dudden, which are moſt dangerous, none; and it is no uncommon thing for perſons to paſs over in parties of 100 at a time like caravans, under the direction of the carriers, who go to or fro every day. The ſands are leſs dangerous than formerly, being more uſed and better known, and travellers never going without the carriers or guides. "Furnis abbey up in the mountains," was begun at Tulket in Amounderneſs 1124, by Stephen earl of Boulogne, afterwards king of England, for the monks of Savigni in France, and three years after removed to this valley, then called *Bekangeſgill*, or, "the vale of nightſhade." It was of the Ciſtertian order, endowed with

Fourneſs.

Fourneſs || Fowl.

above 800l. per ann. Out of the monks of this abbey, Mr Camden informs us, the biſhops of the Iſle of Man, which lies oppoſite to it, uſed to be choſen by ancient cuſtom; it being as it were the mother of many monaſteries in Man and Ireland. Some ruins, and part of the foſſe which ſurrounded the monaſtery, are ſtill to be ſeen at Tulket. The remains at Fourneſs breathe that plain ſimplicity of the Ciſtertian abbeys; the chapter-houſe was the only piece of elegant Gothic about it, and its roof has lately fallen in. Part of the painted glaſs from the eaſt window, repreſenting the crucifixion, &c. is preſerved at Windermere church in Bowlneſs, Weſtmorland. The church (except the north ſide of the nave), the chapter-houſe, refectory, &c. remain, only unroofed.

FOURTH REDUNDANT, in *Muſic*. See INTERVAL.

FOWEY, or FOY, a town of Cornwall in England, 240 miles from London, with a commodious haven on the Channel. It is a populous place, extending above one mile on the eaſt ſide of a river of its own name; and has a great ſhare in the fiſhing trade, eſpecially pilchards. It roſe ſo much formerly by naval wars and piracies, that in the reign of Edward III. its ſhips refuſing to ſtrike when required as they ſailed by Rye and Winchelſea, were attacked by the ſhips of thoſe ports, but defeated them; whereupon they bore their arms mixed with the arms of thoſe two cinque-ports, which gave riſe to the name of the "Gallants of Fowey." And we learn from Camden, that this town quartered a part of the arms of every one of the cinque ports with their own; intimating, that they had at times triumphed over them all: and indeed once they were ſo powerful, that they took ſeveral of the French men of war. In the reign of Edward III. they reſcued certain ſhips of Rye from diſtreſs, for which this town was made a member of the cinque-ports. Edward IV. favoured Fowey ſo much, that when the French threatened to come up the river to burn it, he cauſed two towers, the ruins of which are yet viſible, to be built at the public charge for its ſecurity: but he was afterwards ſo diſguſted with the inhabitants for attacking the French after a truce proclaimed with Louis XI. that he took away all their ſhips and naval ſtores, together with a chain drawn acroſs the river between the two forts above mentioned, which was carried to Dartmouth. It is ſaid they were ſo inſolent, that they cut off the ears of the king's purſuivants; for which ſome lives were forfeited as well as eſtates. The corporation conſiſts of a mayor, recorder, 8 aldermen, a town clerk, and 2 aſſiſtants. The market is on Saturday, the fairs May-day and Sept. 10. Here are a fine old church, a free ſchool, and an hoſpital. The toll of the market and fairs, and keyage of the harbour, were veſted in the corporation on the payment of a fee-farm rent of about 40s. It does not appear to have ſent members to parliament before the 13th of Queen Elizabeth. Here is a coinage for the tin; of which a great quantity is dug in the country to the north and weſt of it. The river Foy, or Foath, is very broad and deep here, and was formerly navigable as high as Leſtwithiel. W. Long. 5°. N. Lat. 50. 27.

FOWL, among zoologiſts, denotes the larger ſorts of birds, whether domeſtic or wild: ſuch as geeſe, pheaſants, partridges, turkeys, ducks, &c.

Tame fowl make a neceſſary part of the ſtock of a country farm. See POULTRY.

Fowl || Fox.

Fowls are again diſtinguiſhed into two kinds, viz. *land* and *water* fowl, theſe laſt being ſo called from their living much in and about water: alſo into thoſe which are accounted *game*, and thoſe which are not. See GAME.

FOWLING, the art of catching birds by means of bird-lime, decoys, and other devices, or the killing of them by the gun. See *BIRD-Catching*, *BIRD-Lime*, DECOY, SHOOTING, and the names of the different birds in the order of the alphabet.

FOWLING, is alſo uſed for the purſuing and taking birds with hawks, more properly called FALCONRY or HAWKING. See theſe articles.

FOWLING Piece, a light gun for ſhooting birds. That piece is always reckoned beſt which has the longeſt barrel, from $5\frac{1}{2}$ to 6 feet, with a moderate bore; though every fowler ſhould have them of different ſizes, ſuitable to the game he deſigns to kill. The barrel ſhould be well poliſhed and ſmooth within, and the bore of an equal bigneſs from one end to the other; which may be proved, by putting in a piece of paſteboard, cut of the exact roundneſs of the top: for if this goes down without ſtops or ſlipping, you may conclude the bore good. The bridge-pan muſt be ſomewhat above the touch-hole, and ought to have a notch to let down a little powder: this will prevent the piece from recoiling, which it would otherwiſe be apt to do. As to the locks, chooſe ſuch as are well filled with true work, whoſe ſprings muſt be neither too ſtrong nor too weak. The hammer ought to be well hardened, and pliable to go down to the pan with a quick motion.

FOX, in *Zoology*. See CANIS, MAMMALIA *Index*.

The fox is a great nuiſance to the huſbandman, by taking away and deſtroying his lambs, geeſe, poultry, &c. The common way to catch him is by gins; which being baited, and a train made by drawing raw fleſh acroſs in his uſual paths or haunts to the gin, it proves an inducement to bring him to the place of deſtruction.

The fox is alſo a beaſt of chaſe, and is taken with greyhounds, terriers, &c. See HUNTING.

FOX, *John*, the martyrologiſt, was born at Boſton in Lincolnſhire, in the year 1517. At the age of 16 he was entered a ſtudent of Brazen-Noſe college in Oxford; and in 1543 he proceeded maſter of arts, and was choſen fellow of Magdalen college. He diſcovered an early genius for poetry, and wrote ſeveral Latin comedies, the ſubjects taken from Scripture, which his ſon aſſures us were written in an elegant ſtyle. Forſaking the muſes, he now applied himſelf with uncommon aſſiduity to the ſtudy of divinity, particularly church-hiſtory; and, diſcovering a premature propenſity to the doctrine of reformation, he was expelled the college as an heretic. His diſtreſs on this occaſion was very great; but it was not long before he found an aſylum in the houſe of Sir Thomas Lucy of Warwickſhire, who employed him as a tutor to his children. Here he married the daughter of a citizen of Coventry. Sir Thomas's children being now grown up, after reſiding a ſhort time with his wife's father, he came to London; where finding no immediate means of ſubſiſtence, he was reduced to the utmoſt degree of want; but was at length

Fox, Fox-glove.

length (as his ſon relates) miraculouſly relieved in the following manner: As he was one day ſitting in St Paul's church, emaciated with hunger, a ſtranger accoſted him familiarly, and, bidding him be of good cheer, put a ſum of money into his hand; telling him at the ſame time, that in a few days new hopes were at hand. He was ſoon after taken into the family of the ducheſs of Richmond, as tutor to the earl of Surrey's children, who, when their father was ſent to the Tower, were committed to her care. In this family he lived, at Ryegate in Surrey, during the latter part of the reign of Henry VIII. the entire reign of Edward VI. and part of that of Queen Mary: but at length, perſecuted by his implacable enemy Biſhop Gardiner, he was obliged to ſeek refuge abroad. Baſil in Switzerland was the place of his retreat, where he ſubſiſted by correcting for the preſs. On the death of Queen Mary he returned to England; where he was graciouſly received by his former pupil the duke of Norfolk, who retained him in his family as long as he lived, and bequeathed him a penſion at his death. Mr Secretary Cecil alſo obtained for him the rectory of Shipton near Saliſbury; and we are aſſured that he might have had conſiderable church preferment, had it not been for his unwillingneſs to ſubſcribe to the canons. He died in the year 1587, in the 70th year of his age; and was buried in the chancel of St Giles's, Cripplegate. He was a man of great induſtry, and conſiderable learning; a zealous, but not a violent reformer; a nonconformiſt, but not an enemy to the church of England. He left two ſons; one of whom was bred a divine, the other a phyſician. He wrote many pieces; but his principal work is, the Acts and Monuments of the Church, &c. commonly called *Fox's Book of Martyrs*. His facts are not always to be depended on, and he often loſes his temper; which, conſidering the ſubject, is not much to be wondered at.

Fox, *George*, the founder of the ſect of Engliſh Quakers, was a ſhoemaker in Nottingham. The accounts of thoſe times tells us, that as he wrought at his trade, he uſed to meditate much on the Scriptures; which, with his ſolitary courſe of life, improving his natural melancholy, he began at length to fancy himſelf inſpired; and in conſequence thereof ſet up for a preacher.

He propoſed but few articles of faith; inſiſting chiefly on moral virtue, mutual charity, the love of God, and a deep attention to the inward motions and ſecret operations of the Spirit; he required a plain ſimple worſhip, and a religion without ceremonies, making it a principal point to wait in profound ſilence the directions of the Holy Spirit. Fox met with much rough treatment for his zeal, was often impriſoned, and ſeveral times in danger of being knocked on the head. But all diſcouragements notwithſtanding, his ſect prevailed much, and many conſiderable men were drawn over to them; among whom were BARCLAY and PENN. He died in 1681. His followers were called *Quakers*, in deriſion of ſome unuſual ſhakings and convulſions with which they were ſeized at their firſt meetings. See QUAKERS.

FOX-Glove. See DIGITALIS, BOTANY and MATERIA MEDICA *Index*.

Fox-iſlands.

FOX-Iſlands, the name of a group of iſlands, 16 in number, ſituated between the eaſtern coaſt of Kamtſchatka and the weſtern coaſt of the continent of America. Each iſland has a particular name; but the general name *Fox-Iſlands* is given to the whole group, on account of the great number of black, gray, and red foxes with which they abound. The dreſs of the inhabitants conſiſts of a cap, and a fur coat which reaches down to the knee. Some of them wear common caps of a party-coloured bird ſkin, upon which they leave part of the wings and tail. On the fore part of their hunting and fiſhing caps, they place a ſmall board like a ſkreen, adorned with the jaw bones of ſea bears, and ornamented with glaſs beads, which they receive in barter from the Ruſſians. At their feſtivals and dancing parties they uſe a much more ſhowy ſort of caps. They feed upon the fleſh of all ſorts of ſea animals, and generally eat it raw. But if at any time they chooſe to dreſs their victuals, they make uſe of a hollow ſtone; having placed the fiſh or fleſh therein, they cover it with another, and cloſe the interſtices with lime or clay. They then lay it horizontally upon two ſtones, and light a fire under it. The proviſion intended for keeping is dried without ſalt in the open air. Their weapons conſiſt of bows, arrows, and darts; and for defence they uſe wooden ſhields. The moſt perfect equality reigns among theſe iſlanders. They have neither chiefs nor ſuperiors, neither laws nor puniſhments. They live together in families, and ſocieties of ſeveral families united, which form what they call a *race*, who, in caſe of an attack or defence, mutually help and ſupport each other. The inhabitants of the ſame iſland always pretend to be of the ſame race; and every perſon looks upon his iſland as a poſſeſſion, the property of which is common to all the individuals of the ſame ſociety. Feaſts are very common among them, and more particularly when the inhabitants of one iſland are viſited by thoſe of the others. The men of the village meet their gueſts beating drums, and preceded by the women, who ſing and dance. At the concluſion of the dance, the hoſts ſerve up their beſt proviſions, and invite their gueſts to partake of the feaſt. They feed their children when very young with the coarſeſt fleſh, and for the moſt part raw. If an infant cries, the mother immediately carries it to the ſea-ſide, and whether it be ſummer or winter, holds it naked in the water until it is quiet. This cuſtom is ſo far from doing the children any harm, that it hardens them againſt the cold, and they accordingly go barefooted through the winter without the leaſt inconvenience. They ſeldom heat their dwellings; but when they are deſirous of warming themſelves, they light a bundle of hay, and ſtand over it; or elſe they ſet fire to train-oil, which they pour into a hollow ſtone. They have a good ſhare of plain natural ſenſe, but are rather ſlow of underſtanding. They ſeem cold and indifferent in moſt of their actions; but let an injury, or even a ſuſpicion only, rouſe them from this phlegmatic ſtate, and they become inflexible and furious, taking the moſt violent revenge without any regard to the conſequences. The leaſt affliction prompts them to ſuicide; the apprehenſion of even an uncertain evil often leads them to deſpair; and

Fox-ſtands || Fraction.

they put an end to their days with great apparent inſenſibility.

FRACASTOR, JEROME, an eminent Italian poet and phyſician, was born at Verona in the year 1482. Two ſingularities are related of him in his infancy: one is, that his lips adhered ſo cloſely to each other when he came into the world, that a ſurgeon was obliged to divide them with his inciſion knife; the other, that his mother was killed with lightning, while he, though in her arms at the very moment, eſcaped unhurt. Fracaſtor was of parts ſo exquiſite, and made ſuch progreſs in every thing he undertook, that he became eminently ſkilled not only in the belles letters, but in all arts and ſciences. He was a poet, a philoſopher, a phyſician, an aſtronomer, and a mathematician. He was a man of vaſt conſequence in his time; as appears from Pope Paul III.'s making uſe of his authority to remove the council of Trent to Bologna, under the pretext of a contagious diſtemper, which, as Fracaſtor depoſed, made it no longer ſafe to continue at Trent. He was intimately acquainted with Cardinal Bembus, Julius Scaliger, and all the great men of his time. He died of an apoplexy at Caſi near Verona, in 1553: and in 1559, the town of Verona erected a ſtatue in honour of him.

He was the author of many performances, both as a poet and a phyſician: yet never man was more diſintereſted in both theſe capacities than he: evidently ſo as a phyſician, for he practiſed without fees; and as a poet, whoſe uſual reward is glory, nothing could be more indifferent. It is owing to this indifference, that we have ſo little of his poetry, in compariſon of what he wrote; and that, among other compoſitions, his Odes and Epigrams, which were read in manuſcript with infinite admiration, yet, never paſſing the preſs, were loſt. What we have now of his, are the three books of "Siphilis, or of the French diſeaſe;" a book of Miſcellaneous Poems; and two books of his poem, entitled, *Joſeph*, which he began at the latter end of his life, but did not live to finiſh. And theſe works, it is ſaid, would have periſhed with the reſt, if his friends had not taken care to preſerve and communicate copies of them: For Fracaſtor, writing merely for amuſement, never troubled himſelf in the leaſt about what became of his works after they once got out of his hands. Fracaſtor compoſed alſo a poem, called *Alcon, ſive de cura canum venaticorum*. His poems as well as his other works are all written in Latin. His medical pieces are, *De Sympathia et Antipathia,—De contagione et contagioſis morbis,—De cauſis criticorum dierum,—De vini temperatura*, &c. His works have been printed ſeparately and collectively. The beſt edition of them is that of Padua 1735, in 2 vols. 4to.

FRACHES, in the glaſs trade, are the flat iron pans into which the glaſs veſſels already formed are put when in the tower over the working furnace, and by means of which they are drawn out through the leers, that they may be taken gradually from the fire, and cool by degrees.

FRACTION, in *Arithmetic* and *Algebra*, a part or diviſion of an unit or integer; or a number which ſtands to an unit in the relation of a part to its whole. The word literally imports a broken number.

Fractions are uſually divided into decimal, ſexageſimal, and vulgar. See ALGEBRA and ARITHMETIC.

Fractions || Frame

FRACTURE, in *Surgery*, a rupture of a bone or a ſolution of continuity in a bone when it is cruſhed or broken by ſome external cauſe. See SURGERY *Index*.

FRÆNUM, or FRENUM, *Bridle*, in *Anatomy*, a name given to divers ligaments, from their office in retaining and curbing the motions of the parts they are fitted to.

FRÆNUM Linguæ, or *Bridle of the Tongue*; a membranous ligament, which ties the tongue to the os hyoides, larynx, fauces, and lower parts of the mouth. In ſome ſubjects the *frænum* runs the whole length of the tongue to the very tip; in which caſes, if it were not cut, it would take away all poſſibility of ſpeech. See *TONGUE-Tied*.

FRÆNUM Penis, a ſlender ligament, whereby the prepuce is tied to the lower part of the glans of the penis. Nature varies in the make of this part; it being ſo ſhort in ſome, that unleſs divided it would not admit of perfect erection. There is alſo a kind of little *frænum*, faſtened to the lower part of the clitoris.

FRAGA, a ſtrong town with a handſome caſtle, in the kingdom of Arragon in Spain. It is ſtrong by ſituation among the mountains; having the river Cinca before it, whoſe high banks are difficult of acceſs; and at its back a hill, which cannot eaſily be approached with large cannon. Alphonſo VII. king of Arragon, and the firſt of that name of Caſtile, was killed by the Moors in 1134, when he beſieged this town. E Long. 0. 23. N. Lat. 41. 28.

FRAGARIA, the STRAWBERRY, a genus of plants belonging to the icoſandria claſs; and in the natural method ranking under the 35th order, *Senticoſæ*. See BOTANY *Index*; and for an account of the varieties and culture, ſee GARDENING *Index*.

FRAIL, a baſket made of ruſhes or the like, in which are packed up figs, raiſins, &c. It ſignifies alſo a certain quantity of raiſins, about 75 pounds.

FRAISE, in *Fortification*, a kind of defence conſiſting of pointed ſtakes, ſix or ſeven feet long, driven parallel to the horizon into the retrenchments of a camp, a half moon, or the like to prevent any approach or ſcalade

Fraiſes differ from palliſades chiefly in this, that the latter ſtand perpendicular to the horizon, and the former jet out parallel to the horizon, or nearly ſo, being uſually made a little ſloping, or with the points hanging down. Fraiſes are chiefly uſed in retrenchments and other works thrown up of earth; ſometimes they are found under the parapet of a rampart, ſerving inſtead of the cordon of ſtone uſed in ſtone works.

To FRAISE a Battalion, is to line the muſqueteers round with pikes, that in caſe they ſhould be charged with a body of horſe, the pikes being preſented, may cover the muſqueteers from the ſhock, and ſerve as a barricade.

FRAME, in *Joinery*, a kind of caſe, wherein a thing is ſet or encloſed, or even ſupported; as a window frame, a picture frame, &c.

FRAME is alſo a machine uſed in divers arts; as,

FRAME, among printers, is the ſtand which ſupports the caſes. See CASE.

FRAME,

Frame || France.

FRAME, among founders, a kind of ledge enclosing a board; which, being filled with wetted sand, serves as a mould to cast their works in. See FOUNDERY.

FRAME is more particularly used for a sort of loom, whereon artificers stretch their linens, silks, stuffs, &c. to be embroidered, quilted, or the like.

FRAME, among painters, a kind of square, consisting of four long slips of wood joined together, whose intermediate space is divided by threads into several little squares like a net; and hence sometimes called *reticula*. It serves to reduce figures from great to small; or, on the contrary, to augment their size from small to great.

FRAMLINGHAM, a town in Suffex, 88 miles from London. It is a large old place, with a castle, supposed to have been built by some of the first kings of the East Angles; the walls, yet standing, are 44 feet high, 8 thick, with 13 towers 14 feet above them, two of which are watch-towers. To this castle the princess, afterwards Queen Mary I. retired, when the Lady Jane Grey was her competitor for the crown. The town is pleasantly situated, though but indifferently built, upon a clay hill, in a fruitful soil and healthy air, near the source of the river Ore, by some called *Winckel*, which runs through it to Orford. It has a spacious place for the market, which is held on Saturday; and a large stately church built all of black flint, with a steeple 100 feet high; two good alms-houses; and a free-school.

FRANC. See FRANK.

FRANCE, a large kingdom of Europe, situated between 5° W. and 7° E. Long. and between 43° and 51° N. Lat. being bounded by the English channel and the Austrian Netherlands on the north; by Germany, Switzerland, Savoy, and Piedmont, in Italy, on the east; by the Mediterranean sea, and the Pyrenean mountains, which separate it from Spain, on the south; and by the bay of Biscay on the west.

1 First subdued by Julius Cæsar.

The kingdom of France was originally possessed by the *Celtes* or *Gauls*. They were a very warlike people, and often checked the progress of the Roman arms: nor did they yield till the time of Julius Cæsar, who totally subdued their country, and reduced it to the form of a Roman province *. The Romans continued in quiet possession of Gaul, as long as their empire retained its strength, and they were in a condition to repress the incursions of the German nations, whom even in the zenith of their power they had not been able to subdue. But in the reign of the emperor Valerian, the ancient Roman valour and discipline had begun to decline, and the same care was not taken to defend the provinces as formerly. The barbarous nations, therefore, began to make much more frequent incursions; and among the rest the *Franks*, a German nation, inhabiting the banks of the Rhine, proved particularly troublesome. Their origin is variously accounted for; but the most probable supposition is, that about the time of the emperor Gordian, the people inhabiting the banks of the Lower Rhine, entered into a confederacy with those who dwelt on the Weser, and both together assumed the name of *Franks* or *Freemen*. Their first irruption, we are told by Valesius, happened in the year 254, the second of Valerian's reign. At this time they were but few in number; and were repulsed by Aurelian, afterwards emperor.

* See *Gaul*.

2 Invaded by the Franks.

France.

Not discouraged by this check, they returned two years after in far greater numbers; but were again defeated by Gallienus, whom Valerian had chosen for his partner in the empire. Others, however, continued to pour in from their native country in such multitudes, that Gallienus, no longer able to drive them out by force of arms, made advantageous proposals to one of their chiefs, whom he engaged to defend the frontiers against his countrymen as well as other invaders.

This expedient did not long answer the purpose. In 260 the Franks, taking advantage of the defeat and captivity of Valerian in Persia, broke into Gaul, and afterwards into Italy, committing everywhere dreadful ravages. Five years afterwards they invaded Spain; which they possessed, or rather plundered, for the space of 12 years: nor could they be driven out of Gaul till the year 275, when the emperor Probus not only gave them a total overthrow in that country, but pursued them into their own, where he built several forts to keep them in awe. This intimidated them so much, that nine of their kings submitted to the emperor and promised an annual tribute.—They continued quiet till the year 287; when, in conjunction with the Saxon pirates, they plundered the coasts of Gaul, carrying off an immense booty. To revenge this insult, the emperor Maximian entered the country of the Franks the following year, where he committed such ravages that two of their kings submitted to him; and to many of the common people who chose to remain in Gaul, he allowed lands in the neighbourhood of Treves and Cambray.

The restless disposition of the Franks, however, did not allow them to remain long in quite. About the year 293, they made themselves masters of Batavia and part of Flanders; but were entirely defeated, and forced to surrender at discretion, by Constantius the father of Constantine the Great, who transplanted them into Gaul. Their countrymen in Germany continued quiet till the year 306, when they renewed their depredations; but being overtaken by Constantine the Great, two of their kings were taken prisoners, and thrown to the wild beasts in the shows exhibited on that occasion.

All these victories, however, as well as many others said to have been gained by the Romans, were not sufficient to prevent the incursions of this restless and turbulent nation: insomuch that, in the year 355, they had made themselves masters of 40 cities in the province of Gaul. Soon after, they were totally defeated by the emperor Julian, and again by Count Theodosius, father to the emperor of that name; but in the year 388, they ravaged the province with more fury than ever, and cut off a whole Roman army that was sent against them. As the western empire was at this time in a very low state, they for some time found more interruption from other barbarians than from the Romans, till their progress was checked by Aetius.

3 Pharamond the first king.

When the war with Aetius broke out, the Franks were governed by one *Pharamond*, the first of their kings of whom we have any distinct account. He is supposed to have reigned from the year 417 or 418, to 428; and is thought by Archbishop Usher to have been killed in the war with Aetius. By some he is

France. ſuppoſed to have compiled the Salic laws, with the aſſiſtance of four ſages named *Wiſegaſt*, *Loſegaſt*, *Widegaſt*, and *Solegaſt*. But Valeſius is of opinion that the Franks had no written laws till the time of Clovis.

4 Clodio. Pharamond was ſucceeded by his ſon Clodio, who likewiſe carried on a war againſt the Romans. He is ſaid to have received a terrible overthrow from Aetius near the city of Lens; notwithſtanding which, he advanced to Cambray, and made himſelf maſter of that city, where for ſome time he took up his reſidence. After this he extended his conqueſts as far as the river Somme, and deſtroyed the cities of Treves and Cologne, Tournay and Amiens. He died in the year 448, and was ſucceeded by Merovæus.

5 Merovæus. Authors are not agreed whether the new king was brother, or ſon, or any relation at all, to Clodio. It ſeems probable indeed, that he was of a different family; as from him the firſt race of French kings were ſtyled *Merovingian*. He was honoured and reſpected by his people, but did not greatly enlarge the boundaries of his kingdom. He died in 458.

6 Childeric. Merovæus was ſucceeded by his ſon Childeric; who being no longer kept in awe by Aetius, made war on the Romans, and extended his conqueſts as far as the river Loire. He is ſaid to have taken the city of Paris after a ſiege of five years, according to ſome, and of ten, according to others. The Roman power was now totally deſtroyed in Italy; and therefore *Clodovæus*, *Clovis*, or *Louis*, for his name is differently written, who ſucceeded Childeric, ſet himſelf about making an entire conqueſt of Gaul. Part of the province was ſtill retained by a Roman named *Syagrius*, who probably had become ſovereign of the country on the downfall of the weſtern empire in 476. He was defeated and taken priſoner by Clovis, who afterwards cauſed him to be beheaded, and ſoon after totally reduced his dominions.

7 French monarchy eſtabliſhed by Clovis. Thus was the French monarchy eſtabliſhed by Clovis in the year 487. He now poſſeſſed all the country lying between the Rhine and the Loire; which, though a very extenſive dominion, was yet conſiderably inferior to what it is at preſent.

Clovis had been educated in the Pagan religion, and continued in that profeſſion till the 30th year of his age; notwithſtanding which, he allowed his ſubjects full liberty of conſcience. Having married, however, Clotilda, daughter of the duke of Burgundy; this princeſs, who was a zealous Chriſtian, uſed all her influence with her huſband to perſuade him to embrace her religion. For ſome time he continued to waver; but happening to gain a battle, where, being in great danger, he had invoked the god of Clotilda and the Chriſtians, he afterwards gave ſuch a favourable ear to the diſcourſes of Remigius biſhop of Rheims, that he ſoon declared himſelf a convert, and was baptized in the year 496. His acknowledgment of the truths of the goſpel was not followed by any amendment of life; on the contrary, he employed the remainder of his life in the aggrandizement of himſelf and extenſion of his dominions by the moſt abominable treachery, fraud, and violence. In his attacks on Armorica he proved unſucceſsful. The inhabitants of this country, which comprehended the maritime part of ancient Gaul lying between the rivers Seine and Loire, had united for their defence; and though abandoned by the Romans, made a powerful defence againſt the barbarians who aſſaulted them on all ſides. Clovis, finding them too powerful to be ſubdued by force, propoſed an union with his people, which they readily accepted, and this the more eaſily on account of his profeſſing the Chriſtian religion. Thus the Chriſtianity of Clovis in ſeveral inſtances proved ſubſervient to the purpoſes of his ambition, and his power became gradually very formidable. The Burgundians at this time poſſeſſed all the country from the foreſt of Voſges to the ſea of Marſeilles, under Gondebaud the uncle of Clotilda; who to ſecure his own authority, had put to death two of his brothers, one of whom was the father of the French queen. The third brother, *Godageſil*, whom he had ſpared and allowed to poſſeſs the principality of Geneva, conſpired with Clovis to drive him from his dominions. A war having commenced between the French and Burgundian monarchs, the latter was deſerted in a battle by Godageſil, and obliged to fly to Avignon, leaving his antagoniſt maſter of the cities of Lyons and Vienne. The victor next laid ſiege to Avignon; but it was defended with ſuch vigour, that Clovis at laſt thought proper to accept of a ſum of money and an annual tribute from Gondebaud; who was likewiſe obliged to cede to Godageſil the city of Vienne, and ſeveral other places taken during the war. France.

Gondebaud no ſooner found himſelf at liberty from his enemies, than he aſſembled a powerful army; with which he advanced towards Vienne, where Godageſil himſelf reſided at that time. The place was garriſoned by 5000 Franks, and might have made conſiderable reſiſtance; but Gondebaud being admitted through the ſubterraneous paſſage of an aqueduct, maſſacred moſt of the Franks, ſent the reſt priſoners to the king of the Viſigoths, and put Godageſil to death. This was quickly followed by the ſubmiſſion of all the other places which had owned the authority of Godageſil: and Gondebaud, now thinking himſelf able to reſiſt the power of Clovis, ſent a meſſage to inform him, that he muſt no longer expect the promiſed tribute; and though Clovis was very much mortified with this defection, he found himſelf obliged for the preſent to put up with the injury, and accept of the alliance and military ſervice of the king of Burgundy.

His next expedition was againſt the Viſigoths, who poſſeſſed conſiderable territories on both ſides of the Pyrenean mountains. His motives for this undertaking were expreſſed in the following ſpeech to his nobility when aſſembled in the city of Paris, which he conſidered as the capital of his dominions. "It is with concern (ſaid the religious monarch) that I ſuffer the Arians to poſſeſs the moſt fertile part of Gaul: let us, with the aid of God, march againſt them; and having conquered them, annex their kingdom to our dominions." The nobility approved of the ſcheme; and Clovis marched againſt a prince for whom he had but lately profeſſed the greateſt regard, vowing to erect a church in honour of the holy apoſtles, if he ſucceeded in his enterpriſe. Alaric the king of the Viſigoths was a young man deſtitute of military experience, though perſonally brave. He did not therefore heſitate at engaging his antagoniſt; but unable to contend with the veteran troops of Clovis, his army was utterly defeated on the banks of the Clain, 10 miles

France. miles ſouth of Poictiers, in the year 507. Alaric, perceiving the ruin of his troops, ruſhed againſt Clovis in perſon, by whom he was killed, and the remainder of the army purſued for ſome time with great ſlaughter. After this victory the province of Aquitaine ſubmitted, and Clovis eſtabliſhed his winter quarters at Bourdeaux. Thouloufe ſurrendered next ſpring; and the royal treaſures of the Viſigoths were tranſported to Paris. Angouleme was next reduced, and the city of Arles inveſted. But here the victorious career of Clovis was ſtopped by Theodoric king of the Oſtrogoths, who had overturned the dominion of Odoacer in Italy. He had married Abolfleda the ſiſter of Clovis, but had alſo given his own daughter in marriage to the king of the Viſigoths, and had endeavoured, as much as was in his power, to preſerve a good underſtanding between the two ſovereigns. Finding this impoſſible however, and that no bounds could be ſet to the ambition of Clovis, he ſent one of his generals with a powerful army againſt him; by whom the French monarch was defeated with the loſs of 30,000 men. By this misfortune Clovis was obliged to raiſe the ſiege of Arles with precipitation: however, the Franks ſtill retained the greateſt part of their conqueſts, and the province of Aquitaine was indiſſolubly annexed to their empire.

8 Is honoured with the title of *Roman conſul.* In 509, Clovis had the title of Roman conſul; by which means the people of Rome were inſenſibly led to pay a peculiar regard to the French monarchs: and Clovis was now ſuppoſed to be inveſted with a juſt title to all his conqueſts in whatever manner they had been acquired. He was ſolemnly inveſted with his new dignity in the church of St Martin in the city of Tours; after which he entered the cathedral clothed in a purple tunic and mantle, the badges of his office.

Clovis now proceeded to augment his power by the murder of his kinſmen the princes of the Merovingian race. Among thoſe who periſhed on this occaſion were Sigebert king of Cologne, with his ſon Cloderic; Cararic, another prince whoſe dominions have not been accurately pointed out by hiſtorians; Ranacaire, who governed the preſent dioceſe of Cambray; and Renomer, king of the territory of Maine. All theſe murders, however, were expiated, according to the views of the clergy of thoſe times, by the great zeal he expreſſed in the cauſe of Chriſtianity, and his liberality to the church.

Clovis died in the year 511, after having reformed and publiſhed the Salic laws: a few lines of which, debarring women from inheriting any part of the Salic lands, have been extended ſo far as to deprive the females of the royal family of France of their right of ſucceſſion to the throne of that kingdom.

9 His dominions divided among his children. Clovis was buried in the church of St Peter and St Paul, now Genevieve, in the city of Paris, where his tomb is ſtill to be ſeen. His dominions were divided among his four ſons. Thieri, or Theodoric, the eldeſt, had the eaſtern part of the empire: and, from his making the city of Metz his capital, is commonly called the *king of Metz*. Clodomir, the eldeſt ſon by Clotilda, had the kingdom of Orleans; Childebert, and Clotaire, who were both infants, had the kingdoms of Paris and Soiſſons, under the tutelage of their mother. The prudence of Clotilda kept matters quiet in all the parts of the empire for eight years; but about the year 520, a numerous fleet of Danes arrived at the mouth of the Meuſe; and their king Cochiliac, having landed his forces, began to deſtroy the country with fire and ſword. Againſt him Thieri ſent his ſon Theodobert, who defeated the Daniſh army and navy, and killed their king, forcing the reſt to retire with precipitation. France.

In 522, Hermanfroi king of Thuringia, having deſtroyed one of his brethren named *Berthaire*, and ſeized on his dominions, applied to Thieri for aſſiſtance againſt his other brother Balderic, whom he intended to treat in the ſame manner. In this infamous enterpriſe Thieri embarked, on condition that he ſhould have one half of Balderic's dominions; but after the unhappy prince was overcome and killed in battle, Hermanfroi ſeized all his dominions. Thieri had no opportunity of revenging himſelf till the year 531; when perceiving the power of the Oſtrogoths, whom he much dreaded, to be conſiderably leſſened by the death of King Theodoric, he engaged his brother Clotaire to aſſiſt him: and they accordingly entered Thuringia with two powerful armies. They joined their forces as ſoon as they had paſſed the Rhine, and were quickly after reinforced by a conſiderable body of troops under the command of Theodobert. The allies attacked the army of Hermanfroi, which was advantageouſly poſted; and having totally defeated it, he was forced to fly from place to place in diſguiſe. Soon after this the capital was taken, and Hermanfroi himſelf being invited to a conference by Thieri, was treacherouſly murdered; after which his extenſive dominions became feudatory to Thieri.

In the mean time, Clotilda had excited her children to make war on the Burgundians, in order to revenge the death of her father Chilperic, whom Gondebaud king of Burgundy had cauſed to be murdered. Gondebaud was now dead, and had left his dominions to his ſons Sigiſmund and Godemar. Sigiſmund's forces were quickly defeated; and he himſelf was ſoon after delivered up by his own ſubjects to Clodomir, who cauſed him to be thrown into a pit where he periſhed miſerably. By his death Godemar became ſole maſter of Burgundy. Clodomir marched againſt him, and defeated him; but purſuing his victory too eagerly, was ſurrounded by his enemies and ſlain. After the reduction of Thuringia, however, Childebert and Clotaire entered the kingdom of Burgundy at the head of a powerful army, and in 534 completed the conqueſt of it; in which, according to ſome, Godemar was killed; according to others, he retired into Spain, and from thence into Africa.

10 Clotaire becomes ſole monarch. In 560 Clotaire became ſole monarch of France. He had murdered the ſons of Clodomir, who was killed in Burgundy as above related. Thieri and his children were dead, as was alſo Childebert; ſo that Clotaire was ſole heir to all the dominions of Clovis. He had five ſons; and the eldeſt of them, named *Chramnes*, had ſome time before rebelled againſt his father in Auvergne. As long as Childebert lived, he ſupported the young prince; but on his death, Chramnes was obliged to implore his father's clemency. He was at this time pardoned; but he ſoon began to cabal afreſh, and engaged the count of Bretagne to aſſiſt him in another rebellion. The Bretons, however, were defeated, and Chramnes determined to make his eſcape; but perceiving

France. ing that his wife and children were furrounded by his father's troops, he attempted to refcue them. In this attempt he was taken prifoner, and with his family was thruft into a thatched cottage near the field of battle; of which the king was no fooner informed, than he commanded the cottage to be fet on fire, and all that were in it perifhed in the flames.

11 The empire again divided.

Clotaire did not long furvive this cruel execution of his fon, but died in 562; and after his death the French empire was divided among his four remaining fons, Caribert, Gontran, Sigebert, and Chilperic—The old king made no divifion of his dominions before he died, which perhaps caufed the young princes to fall out fooner than they would otherwife have done. After his death, however, they divided the kingdom by lot; when Caribert, the eldeft, had the kingdom of Paris; Gontran; the fecond, had Orleans; Sigebert, had Metz (or the kingdom of Auftrafia); and Chilperic had Soiffons. Provence and Aquitaine were poffeffed by all of them in common. The peace of the empire was firft difturbed in 563 by an invafion of the Abares; a barbarous nation, faid to be the remains of the Hunns. They entered Thuringia, which belonged to the dominions of Sigebert: but by him they were totally defeated, and obliged to repafs the Elbe with precipitation. Sigebert purfued them clofe, but readily concluded a peace with them on their firft propofals. To this he was induced, by hearing that his brother Chilperic had invaded his dominions, and taken Rheims and fome other places in the neighbourhood. Againft him, therefore, Sigebert marched with his victorious army, made himfelf mafter of Soiffons his capital, and of the perfon of his eldeft fon Theodobert. He then defeated Chilperic in battle; and not only recovered the places which he had feized, but conquered the greater part of his dominions: nevertheleſs, on the mediation of the other two brothers, Sigebert abandoned all his conqueſts, ſet Theodobert at liberty, and thus reſtored peace to the empire.

Soon after this, Sigebert married Brunehaut daughter to Athanagilde king of the Viſigoths in Spain; and in a little time after the marriage, died Caribert king of Paris, whoſe dominions were divided among his three brethren. In 567 Chilperic married Galſwintha, Brunehaut's eldeſt ſiſter, whom he did not obtain without ſome difficulty. Before her arrival, he diſmiſſed his miſtreſs called *Fredegonde*, a woman of great abilities and firmneſs of mind, but ambitious to the higheſt degree, and capable of committing the blackeſt crimes in order to gratify her ambition. The queen, who brought with her immenſe treaſures from Spain, and made it her whole ſtudy to pleaſe the king, was for ſome time entirely acceptable. By degrees, however, Chilperic ſuffered Fredegonde to appear again at court, and was ſuſpected of having renewed his intercourſe with her; which gave ſuch umbrage to the queen, that ſhe deſired leave to return to her own country, promiſing to leave behind her all the wealth ſhe had brought. The king, knowing that this would render him extremely odious, found means to diſſipate his wife's ſuſpicions, and ſoon after cauſed her to be privately ſtrangled, upon which he publicly married Fredegonde.

12 Infamous conduct of Chilperic.

Such an atrocious action could not fail of exciting the greateſt indignation againſt Chilperic. His dominions were immediately invaded by Sigebert and Gontran, who conquered the greateſt part of them; after which, they ſuddenly made peace, Chilperic conſenting that Brunehaut ſhould enjoy thoſe places which on his marriage he had beſtowed upon Galſwintha, viz. Bourdeaux, Limoges, Cahors, Bigorre, and the town of Bearn, now called *Leſcar*. France.

The French princes, however, did not long continue at peace among themſelves. A war quickly enſued, in which Gontran and Chilperic allied themſelves againſt Sigebert. The latter prevailed; and having forced Gontran to a ſeparate peace, ſeemed determined to make Chilperic pay dear for his repeated perfidy and infamous conduct; when he was aſſaſſinated by a contrivance of Fredegonde, who thus ſaved herſelf and Chilperic from the moſt imminent danger. Immediately on his death, Brunehaut fell into the hands of Chilperic; but Gondebaud, one of Sigebert's beſt generals, made his eſcape into Auſtraſia with Childebert, the only ſon of Sigebert, an infant of about five years of age, who was immediately proclaimed king in room of his father. In a ſhort time, however, Meroveus, eldeſt ſon to Chilperic, fell in love with Brunehaut, and married her without acquainting his father. Chilperic, on this news, immediately went to Rouen, where Meroveus and his conſort were; and having ſeized them, ſent Brunehaut and her two daughters to Metz, and carried Meroveus to Soiſſons. Soon after one of his generals being defeated by Gontran, who eſpouſed Brunehaut's cauſe, Chilperic, in a fit of rage, cauſed Meroveus to be ſhaved and confined in a monaſtery. From hence he found means to make his eſcape, and with great difficulty arrived in Auſtraſia, where Brunehaut would gladly have protected him; but the jealouſy of the nobles was ſo ſtrong, that he was forced to leave that country; and being betrayed into the hands of his father's forces, was murdered at the inſtigation of Fredegonde, as was generally believed. 13 Sigebert aſſaſſinated;

The French empire was at this time divided between Gontran king of Orleans, called alſo king of Burgundy, Chilperic king of Soiſſons, and Childebert king of Auſtraſia. Chilperic found his affairs in a very diſagreeable ſituation. In 579, he had a diſpute with Varoc count of Bretagne, who refuſed to do him homage. Chilperic diſpatched a body of troops againſt him; who were defeated, and he was then forced to ſubmit to a diſhonourable peace. His brother and nephew lived in ſtrict union, and had no reaſon to be very well pleaſed with him. His own ſubjects, being oppreſſed with heavy taxes, were miſerably poor and diſcontented. His ſon Clovis, by a former queen named *Andovera*, hated Fredegonde, and made no ſecret of his averſion. To add to his embarraſſment, the ſeaſons were for a long time ſo unfavourable, that the country was threatened with famine and peſtilence at the ſame time. The king and queen were both attacked by an epidemic diſeaſe which then raged. They recovered; but their three ſons Clodobert, Samſon, and Dagobert, died; after which, the ſight of Clovis became ſo diſagreeable to Fredegonde, that ſhe cauſed him to be murdered, and likewiſe his mother Andovera, left Chilperic's affection for her ſhould return after the tragical death of her ſon.

14 and likewiſe Chilperic.

In 583 Chilperic himſelf was murdered by ſome unknown aſſaſſins, when his dominions were on the point of

France. of being conquered by Gontran and Childebert, who had entered into a league for that purpoſe. After his death Fredegonde implored the protection of Gontran for herſelf and her infant ſon Clotaire; which he very readily granted, and obliged Childebert to put an end to the war. He found himſelf, however, greatly difficulted to keep Fredegonde and Brunehaut in awe; for theſe two princeſſes having been long rivals and implacable enemies, were continually plotting the deſtruction of each other. This, however, he accompliſhed, by favouring ſometimes Brunehaut and ſometimes Fredegonde; ſo that, during his life, neither of them durſt undertake any thing againſt the other.

15 Death of Gontran; On the 28th of March 593, died Gontran, having lived upwards of 60, and reigned 32 years. Childebert ſucceeded to the kingdom without oppoſition, but did not long enjoy it; he himſelf dying in the year 596, and his queen ſhortly after. His dominions were divided between his two ſons Theodobert and Thierri; the firſt of whom was declared king of Auſtraſia, and the latter king of Burgundy. As Theodobert was only in the 11th year of his age, and Thierri in his 10th, Brunehaut governed both kingdoms with an abſolute ſway. Fredegonde, however, took care not to let ſlip ſuch a favourable opportunity as was offered her by the death of Childebert, and therefore made herſelf miſtreſs of Paris and ſome other places on the Seine.

16 and Fredegonde. Upon this Brunehaut ſent againſt her the beſt part of the forces in Auſtraſia, who were totally defeated; but Fredegonde died before ſhe had time to improve her victory, leaving her ſon Clotaire heir to all her dominions.

For ſome time Brunehaut preſerved her kingdom in peace; but in the end her own ambition proved her ruin. Inſtead of inſtructing Theodobert in what was neceſſary for a prince to know, ſhe took care rather to keep him in ignorance, and even ſuffered him to marry a young and handſome ſlave of his father's. The new queen was poſſeſſed of a great deal of affability and good nature; by which means ſhe in a ſhort time gained the affection of her huſband ſo much, that he readily

17 Brunehaut baniſhed. conſented to the baniſhment of Brunehaut. Upon this diſgrace ſhe fled to Thierri king of Burgundy, in the year 599. By him ſhe was very kindly received; and inſtead of exciting jealouſies or miſunderſtandings between the two brothers, ſhe engaged Thierri to attempt the recovery of Paris and the other places which had been wreſted from their family by Fredegonde, procuring at the ſame time a conſiderable body of auxiliaries from the Viſigoths. This meaſure was ſo acceptable to Theodobert, that he likewiſe raiſed a numerous army, and invaded Clotaire's dominions in conjunction with his brother. A battle enſued, in which the forces of Clotaire were totally defeated, and himſelf obliged ſoon after to ſue for peace: which was not granted, but on condition of his yielding up the beſt part of his dominions.

This treaty was concluded in the year 600; but three years afterwards, it was broken by Clotaire. He was again attacked by the two brothers, and the war carried on with great vigour till the next ſpring. At this time Thierri having forced Landri, Clotaire's general, to a battle, gave him a total overthrow, in which the king's infant ſon Meroveus, whom he had ſent along with Landri, was maſſacred; to gratify, as Clotaire pretended, the malice of Brunehaut. After this victory, Thierri marched directly to Paris; fully bent on the deſtruction of his couſin, which now ſeemed inevitable. This, however, was prevented by Theodobert; who no ſooner heard of the victory gained by Thierri, than he became jealous of his ſucceſs, and offered Clotaire ſuch terms of peace as he gladly accepted. The latter having then nothing to fear on the ſide of Auſtraſia, quickly compelled Thierri to liſten to terms of accommodation alſo. France.

This behaviour of Theodobert greatly provoked his brother; and his reſentment was highly inflamed by Brunehaut, who never forgot her diſgrace in being baniſhed from his court. A war was therefore commenced between the two brothers in 605; but it was ſo highly diſapproved of by the nobility, that Thierri found himſelf obliged to put an end to it. The tranquillity which now took place was again diſturbed in 607, by Theodobert's ſending an embaſſy to demand ſome part of Childebert's dominions, which had been added, by the will of that monarch, to thoſe of Burgundy. The nobility of both kingdoms were ſo much averſe to war, that they conſtrained their kings to conſent to a conference, attended by an equal number of troops; but Theodobert, by a ſcandalous breach of his faith, brought double the number, and compelled his brother to ſubmit to what terms he pleaſed. This piece of treachery inſtantly brought on a war; for Thierri was bent on revenge, and his nobility no longer oppoſed him. It was neceſſary, however, to ſecure Clotaire by a negotiation; and accordingly a promiſe was made of reſtoring thoſe parts of his dominions which had formerly been taken from him, provided he would remain quiet. This treaty being finiſhed, Thierri entered Theodobert's dominions, defeated him in two battles, took him priſoner, uſed him with the utmoſt indignity; and having cauſed an infant ſon of his to be put to death, ſent him to his grandmother Brunehaut. By her orders he was firſt ſhaved and confined in a monaſtery; but afterwards, fearing leſt he ſhould make his eſcape, ſhe cauſed him to be put to death.—Clotaire, in the mean time, thought that the beſt method of making Thierri keep his word was to ſeize on thoſe places which he had promiſed to reſtore to him, before his return from the war with Theodobert. This he accordingly did; and Thierri no ſooner heard of his having done ſo, than he ſent him a meſſage requiring him to withdraw his forces, and, in caſe of his refuſal, declared war. Clotaire was prepared for this; and accordingly aſſembled all the forces in his dominions, in order to give him a proper reception. But before Thierri could reach his enemies, he was ſeized with a

18 Death of Thierri. dyſentery; of which he died in the year 612, having lived 26 years, and reigned 17.

On the death of Thierri, Brunehaut immediately cauſed his eldeſt ſon, named *Sigiſbert*, then in the 10th year of his age, to be proclaimed king. It is probable that ſhe intended to have governed in his name with an abſolute ſway; but Clotaire did not give her time to diſcover her intentions. Having great intelligence in Auſtraſia and Burgundy, and knowing that the nobility in both kingdoms were diſaffected to Brunehaut, he declared war againſt her; and ſhe being betrayed by her generals, fell into the hands of her enemies. Clotaire gave her up to the nobles; who generally

France. hated her, and who uſed her in the moſt cruel manner. After having led her about the camp, expoſed to the
19 Brunehaut put to a cruel death. inſults of all who had the meanneſs to inſult her, ſhe was tied by the leg and arm to the tail of an untamed horſe, which, ſetting off at full ſpeed, quickly daſhed out her brains. After this her mangled body was reduced to aſhes, which were afterwards interred in the abbey of St Martin at Autun.

Thus in the year 613, Clotaire became ſole monarch of France; and quietly enjoyed his kingdom till his death, which happened in 628. He was ſucceeded by Dagobert; who proved a great and powerful prince, and raiſed the kingdom of France to a high degree of ſplendour. Dagobert was ſucceeded by his ſons Sigebert and Clovis; the former of whom had the kingdom of Auſtraſia, and the latter that of Burgundy. Both the kings were minors at the time of their acceſſion to the throne, which gave an opportunity to the mayors of the palace (the higheſt officers under the crown) to uſurp the whole authority. Sigebert died in 640, after a ſhort reign of one year; leaving behind him an infant ſon named *Dagobert*, whom he ſtrongly recommended to the care of Grimoalde his mayor of the palace. The miniſter cauſed Dagobert to be immediately proclaimed king, but did not long ſuffer him to enjoy that honour. He had not the cruelty, however, to put him to death; but ſent him to a monaſtery in one of the Weſtern iſlands of Scotland; and then, giving out that he was dead, advanced his own ſon Childebert to the throne. Childebert was expelled by Clovis king of Burgundy; who placed on the throne Childeric, the ſecond ſon of Sigebert. Clovis died ſoon after the revolution, and was ſucceeded in his dominions by his ſon Clotaire; who died in a ſhort time, without iſſue. He was ſucceeded by his brother Childeric; who, after a ſhort reign, was murdered with his queen, at that time big with child, and an infant ſon named *Dagobert;* though another, named *Daniel*, had the good luck to eſcape.

20 Miſerable ſituation of France. The affairs of the French were now in the moſt deplorable ſituation. The princes of the Merovingian race had been for ſome time entirely deprived of their power by their officers called *mayors of the palace*. In Auſtraſia the adminiſtration had been totally engroſſed by Pepin and his ſon Grimaulde; while Archambaud and Ebroin did the ſame in Neuſtria and Burgundy. On the reunion of Neuſtria and Burgundy to the reſt of the French dominions, this miniſter ruled with ſuch a deſpotic ſway, that the nobility of Auſtraſia were provoked to a revolt; electing for their dukes two chiefs named *Martin* and *Pepin*. The forces of the confederates, however, were defeated by Ebroin; and Martin having ſurrendered on a promiſe of ſafety, was treacherouſly put to death. Pepin loſt no time in recruiting his ſhattered forces; but before he had any occaſion to try his fortune a ſecond time in the field of battle, the aſſaſſination of Ebroin delivered him from all apprehenſions from that quarter. After his death, Pepin carried every thing before him, overthrew the royal army under the command of the new miniſter Bertaire; and, having got poſſeſſion of the capital, cauſed himſelf to be declared mayor of the palace; in which ſtation he continued to govern with an abſolute ſway during the remainder of his life.

Pepin (who had got the ſurname of *Heriſtal* from his palace on the Meuſe) died in the year 714, having France. enjoyed unlimited power for 26 years. He appointed his grandſon Theudobalde, then only ſix years of age, to ſucceed him in his poſt of mayor of the palace. This happened during the reign of Dagobert already mentioned; but this prince had too much ſpirit to ſuffer himſelf to be deprived of his authority by an infant. The adherents of the young mayor were defeated in battle, and this defeat was ſoon followed by his death. 21 Exploits of Charles. Martel. Charles, however, the illegitimate ſon of Pepin, was now raiſed to the dignity of duke by the Auſtraſians, and by his great qualities ſeemed every way worthy of that honour. The murder of Dagobert freed him from a powerful opponent; and the young king Chilperic, who after Dagobert's death was brought from a cloiſter to the throne, could by no means cope with ſuch an experienced antagoniſt. On the 19th of March 717, Charles had the good fortune to ſurpriſe the royal camp as he paſſed through the foreſt of Arden; and ſoon after a battle enſued, in which the king's forces were entirely defeated. On this Chilperic entered into an alliance with Eudes duke of Aquitain, whoſe friendſhip he purchaſed by the final ceſſion of all the country which Eudes had ſeized for himſelf. Charles, however, having placed on the throne another of the royal family named *Clotaire*, advanced againſt Chilperic and his aſſociate, whom he entirely defeated near Soiſſons. After this diſaſter, Eudes, deſpairing of ſucceſs, delivered up Chilperic into the hands of his antagoniſt: after having ſtipulated for himſelf the ſame terms which had been formerly granted him by the captive monarch.

Charles now advanced to the ſummit of power, treated Chilperic with great reſpect; and on the death of Clotaire, cauſed him to be proclaimed king of Auſtraſia; by which, however, his own power was not in the leaſt diminiſhed; and from this time the authority of the kings of France became merely nominal; and ſo inactive and indolent were they accounted, that hiſtorians have beſtowed upon them the epithet of *faineans*, i. e. "lazy or idle." Charles, however, had ſtill one competitor to contend with. This was Rainfroy, who had been appointed mayor of the palace; and who made ſuch a vigorous reſiſtance, that Charles was obliged to allow him the peaceable poſſeſſion of the country of Anjou. No ſooner, however, had Charles thus ſet himſelf at liberty from domeſtic enemies, than he was threatened with deſtruction from foreign nations. The Sueviens, Friſons, and Alemanni, were ſucceſſively encountered and defeated. Eudes alſo, who had perfidiouſly broken the treaties to which he had bound himſelf, was twice repulſed; after which Charles invaded Aquitain, and obliged the treacherous duke to hearken to reaſon. This was ſcarce accompliſhed, when he found himſelf engaged with a more formidable enemy than any he had yet encountered. The Saracens having overrun great part of Aſia, now turned their victorious arms weſtward, and threatened Europe with total ſubjection. Spain had already received the yoke; and having paſſed the Pyrenees, they next invaded France, appearing in vaſt numbers under the walls of Thouloufe. Here they were encountered and defeated by Eudes; but this proved only a partial check. The barbarians once more paſſing the Pyrenees, entered France with ſuch a powerful army, that Eudes was no longer able

France. to reſiſt. He encountered them indeed with his accuſtomed valour; but being forced to yield to ſuperior power, he ſolicited the protection and aſſiſtance of Charles. On this occaſion the latter, on account of his valour and perſonal ſtrength, acquired the name of *Martel*, i. e. "the hammer," alluding to the violence of the ſtrokes he beſtowed on his enemies†. Three hundred and ſeventy-five thouſand of the Infidels, among whom was the commander Abdelrahman himſelf, are ſaid to have periſhed in the battle; notwithſtanding which they ſoon made another irruption: but in this they were attended with no better ſucceſs, being again defeated by Charles; who by ſo many victories eſtabliſhed his power on the moſt ſolid foundation. Having again defeated the Friſons, and with his own hand killed their duke, he aſſumed the ſovereignty of the dominions of Eudes after his deceaſe, reſerving to himſelf the claim of homage, which he ought to have yielded to Thierri his lawful ſovereign. At laſt his fame grew ſo great, that he was choſen by Pope Gregory III. for his protector. He offered to ſhake off the yoke of the Greek emperor, and to inveſt Charles with the dignity of Roman conſul; ſending him at the ſame time the keys of the tomb of St Peter; but while this negotiation was going on ſucceſsfully, the pope, the emperor, and Charles Martel himſelf, died. After his death, which happened in the year 741, his dominions were divided among his three ſons, Carloman, Pepin, and Grippon, according to the diſpoſitions he had made in his lifetime. By this Carloman, the eldeſt, had Auſtraſia; Pepin, the ſecond, Neuſtria and Burgundy; while Grippon, the third, had only ſome lands aſſigned him in France; by which he was ſo much diſpleaſed, that the tranquillity of the empire was ſoon diſturbed. With the aſſiſtance of his mother Sonnechilde he ſeized on the city of Lahon, where he endured a violent ſiege. In the end, however, he was obliged to ſubmit; Sonnechilde was put into a monaſtery, and Grippon impriſoned in a caſtle at Arden. The two brothers, having thus freed themſelves from their domeſtic enemy, continued to govern the empire with uninterrupted harmony; but their tranquillity was ſoon diſturbed by the intrigues of Sonnechilde. That enterpriſing and ambitious woman had negotiated a marriage between Odilon duke of Bavaria and Hiltrude the ſiſter of the two princes. This was no ſooner accompliſhed than Odilon, inſtigated by Sonnechilde, and alarmed at the growing power of the two princes, entered into an alliance with Theodobald duke of the Alemanni and Theodoric duke of the Saxons; who having aſſembled a formidable army, advanced directly againſt the princes. They poſted themſelves in an advantageous manner, with the river Lech in their front; but Carloman and Pepin, paſſing the river at different fords in the night time, attacked the camp of the allies with great vigour. The engagement continued doubtful for five hours; but at laſt the intrenchments were forced on all ſides, the Bavarians and Saxons entirely routed, and the vanquiſhed dukes obliged to ſubmit to the clemency of the victors. During their abſence on this expedition, Hunalde, whom Charles Martel had appointed duke of Aquitain, having likewiſe entered into a confederacy with Odilon, paſſed the Loire, ravaged the open country, and burnt the magnificent cathedral of the city of Chartres. The two princes, however, having returned with their victorious army, Hunalde found himſelf obliged to retreat: and even this availed him but little: for the Franks entering the duchy of Aquitain, committed ſuch devaſtations, that Hunalde in deſpair reſigned his dominions to his ſon, and retired into a convent. This event was ſoon followed by a ſimilar reſignation of Carloman, notwithſtanding the uninterrupted ſucceſs he had met with. He ſuddenly took the reſolution of retiring into a convent, and perſiſted in his deſign notwithſtanding the entreaties of Pepin, who, to appearance at leaſt, did all he could to diſſuade him. France

† See *Arabia*, N° 174.

22 France divided among the ſons of Charles.

By the reſignation of Carloman, which happened in the year 746, Pepin was left ſole maſter of France; and in this exalted ſtation he acquitted himſelf in ſuch a manner as has juſtly rendered his name famous to poſterity. One of the firſt acts of his new adminiſtration was to releaſe his brother Grippon from priſon: but that treacherous prince had no ſooner regained his liberty, than he again excited the Saxons to take up arms. His enterpriſe, however, proved unſucceſsful: the Saxons were defeated, their duke Theodoric taken, and his ſubjects obliged to ſubmit to the will of the conqueror; who upon this occaſion cauſed them make a profeſſion of the Chriſtian religion. Grippon then fled to Hiltrude, his half ſiſter, whoſe huſband Odilon was now dead, and had left an infant ſon named *Taſſilon*. He met with a favourable reception from her; but, with his uſual treachery, ſeized both her and her ſon by the aſſiſtance of an army of malecontent Franks, whom he had perſuaded to join him. His next ſtep was to aſſume the ſovereignty and title of duke of Bavaria; but being driven from the throne by Pepin, he was obliged to implore his clemency, which was once more granted. All theſe misfortunes, however, were not yet ſufficient to cure Grippon of his turbulence and ambition: He once more endeavoured to excite diſturbances in the court of Pepin; but being finally detected and baffled, he was obliged to take refuge in Aquitain. 23 Pepin becomes ſole maſter of the kingdom.

Pepin having now ſubdued all his foes both foreign and domeſtic, began to think of aſſuming the title of *king*, after having ſo long enjoyed the regal power. His wiſhes in this reſpect were quite agreeable to thoſe of the nation in general. The nobility, however, were bound by an oath of allegiance to Childeric the nominal monarch at that time: and this oath could not be diſpenſed with but by the authority of the pope. Ambaſſadors for this purpoſe were therefore diſpatched both from Pepin and the nobility to Pope Zachary, the reigning pontiff. His holineſs replied, that it was lawful to transfer the regal dignity from hands incapable of maintaining it to thoſe who had ſo ſucceſsfully preſerved it; and that the nation might unite in the ſame perſon the authority and title of *king*. On this the unfortunate Childeric was degraded from his dignity, ſhaved, and confined in a monaſtery for life; Pepin aſſumed the title of *king of France*, and the line of Clovis was finally ſet aſide. 24 Aſſumes the title of king.

This revolution took place in the year 751. The attention of the new monarch was firſt claimed by a revolt of the Saxons; but they were ſoon reduced to ſubjection, and obliged to pay an additional tribute: and during this expedition againſt them, the king had the ſatisfaction of getting rid of his reſtleſs and treacherous competitor Grippon. This turbulent prince, having

France. having ſoon become weary of reſiding at the court of Aquitain, determined to eſcape from thence, and put himſelf under the protection of Aſtolphus king of the Lombards; but he was killed in attempting to force a paſs on the confines of Italy. Pepin in the mean time continued to puſh his good fortune. The ſubmiſſion of the Saxons was ſoon followed by the reduction of Britanny; and that by the recovery of Narbonne from the Infidels. His next exploit was the protection of Pope Stephen III. againſt Aſtolphus the king of the Lombards, who had ſeized on the exarchate of Ravenna, and inſiſted on being acknowledged king of Rome. The pope unable to contend with ſuch a powerful rival, haſted to croſs the Alps and implore the protection of Pepin, who received him with all the reſpect due to his character. He was lodged in the abbey of St Dennis, and attended by the king in perſon during a dangerous ſickneſs with which he was ſeized. On his recovery, Stephen ſolemnly placed the diadem on the head of his benefactor, beſtowed the regal unction on his ſons Charles and Carloman, and conferred on the three princes the title of *patrician of Rome*. In return for theſe honours, Pepin accompanied the pontiff into Italy at the head of a powerful army. Aſtolphus, unable to withſtand ſuch a powerful antagoniſt, ſhut himſelf up in Pavia, where he was cloſely beſieged by the Franks, and obliged to renounce all pretenſions to the ſovereignty of Rome, as well as to reſtore the city and exarchate of Ravenna, and ſwear to the obſervance of the treaty. No ſooner was Pepin gone, however, than Aſtolphus broke the treaty he had juſt ratified with ſuch ſolemnity. The pope was again reduced to diſtreſs, and again applied to Pepin. He now ſent him a pompous epiſtle in the ſtyle and character of St Peter himſelf; which ſo much inflamed the zeal of Pepin, that he inſtantly ſet out for Italy and compelled Aſtolphus a ſecond time to ſubmit to his terms, which were now rendered more ſevere by the impoſition of an annual tribute. Pepin next made a tour to Rome; but finding that his preſence there gave great uneaſineſs both to the Greeks and to the pope himſelf, he thought proper to finiſh his viſit in a ſhort time. Soon after his return Aſtolphus died, and his dominions were uſurped by his general Didier; who, however, obtained the papal ſanction for what he had done, and was recognized as lawful ſovereign of the Lombards in the year 756.

Pepin returned to France in triumph; but the peace of his dominions was ſoon diſturbed by the revolt of the Saxons, who always bore the French yoke with the utmoſt impatience. Their preſent attempts, however, proved equally unſucceſsful with thoſe they had formerly made; being obliged to ſubmit and purchaſe their pardon not only by a renewal of their tribute, but by an additional ſupply of 300 horſe. But while the king was abſent on this expedition, Vaiſar duke of Aquitain took the opportunity of ravaging Burgundy, where he carried his devaſtations as far as Chalons. Pepin ſoon returned, and entering the dominions of Vaiſar, committed ſimilar devaſtations, and would probably have reduced the whole territory of Aquitain, had he not been interrupted by the hoſtile preparations of his nephew Taſſilon the duke of Bavaria. The king, however, contented himſelf at preſent with ſecuring his frontiers by a chain of poſts, againſt any invaſion; after which he reſumed his enterpriſe on the dominions of Vaiſar. The latter at firſt attempted to impede the progreſs of his antagoniſt by burning and laying waſte the country; but finding this to no purpoſe, he determined to try his fortune in an engagement. Victory declared in favour of Pepin; but he refuſed to grant a peace upon any terms. The French monarch advanced to the banks of the Garonne; while Vaiſar was abandoned by his ally the duke of Bavaria, and even by his own ſubjects. In this diſtreſs he retired with a band of faithful followers into the country of Saintonge, where he defended himſelf as long as poſſible, but was at laſt deprived both of his crown and life by the victor. France.

Thus the duchy of Aquitain was once more annexed to the crown of France; but Pepin had ſcarce time to indulge himſelf with a view of his new conqueſt when he was ſeized with a ſlow fever, which put an end to his life in the year 768, the 54th of his age, and 17th of his reign. He was of a ſhort ſtature, whence he had the ſurname of *Le Bref*, or *the Short*; but his great actions juſtly entitled him to the character of a hero: though under the ſucceeding reign his own fame ſeemed to have been entirely forgot, and on his tomb was only inſcribed, "Here lies the father of Charlemagne." 25 Death of Pepin.

Pepin was ſucceeded in his authority by his two ſons Charles and Carloman; to whom with his dying breath he bequeathed his dominions. They continued to reign jointly for ſome time; but the active and enterpriſing ſpirit of Charles gave ſuch umbrage to the weak and jealous Carloman, that he regarded him with envy, and was on the point of coming to an open rupture with him, when he himſelf was taken off by death, and thus the tranquillity of the empire was preſerved. 26 Succeeded by his two ſons.

The firſt military enterpriſe of Charles was againſt Hunalde, the old duke of Aquitain; who leaving the monaſtery where he had reſided upwards of 20 years, aſſumed the royal title, and was joyfully received by his ſubjects, already weary of the French yoke.—Charles took the field with the utmoſt expedition, and with difficulty prevailed upon his brother Carloman, who was then alive, to join him with his forces. But the junction was ſcarce effected, when Carloman withdrew his forces again, and left his brother to carry on the war in the beſt manner he could. Charles, though thus deſerted, did not heſitate at engaging the enemy; and having overthrown them in a great battle, Hunalde was obliged to fly to the territories of Lupus duke of Gaſcony. Charles quickly ſent an embaſſy demanding the fugitive prince; and Lupus, not daring to diſobey the orders of ſuch a powerful monarch, yielded up the unfortunate Hunalde, who was inſtantly caſt into priſon, from which, however, he afterwards made his eſcape.

The death of Carloman, which happened in the year 771, left Charles ſole maſter of France, but the revolt of the Saxons involved him in a ſeries of wars from which he did not extricate himſelf for 33 years. Theſe had long been tributaries to the French, but frequently revolted; and now, when freed from the terror of Pepin's arms, thought they had a right to ſhake off the yoke altogether. Charles entered their country with a powerful army; and having defeated them in a number 27 Reign of Charles the Great.

France. ber of ſmall engagements, advanced towards Ereſbourg near Paderborn, where they had their capital poſt, and where was the image of their god Irminſul, repreſented as a man completely armed, and ſtanding on a column. The Saxons made an obſtinate defence, but were at laſt obliged to ſubmit; and Charles employed his army three days in demoliſhing the monuments of idolatry in this place; which ſo much diſheartened the whole nation, that for the preſent they ſubmitted to ſuch terms as he pleaſed to impoſe; and which were rendered eaſier than they probably would have been, by the news which Charles now received from Italy.—He had concluded a marriage with the daughter of Didier king of the Lombards; but this had been diſſolved by the pope, who reproached the Lombards with the firſt ſtain of the leproſy. Thus all friendſhip was diſſolved betwixt Didier and Charles; and as the Lombard monarchs ſeem to have had a kind of natural enmity towards the popes, it is not ſurpriſing that it ſhould now break out with uncommon fury. Didier having ſeized and frighted to death Pope Stephen IV. uſed his utmoſt endeavours to reduce his ſucceſſor Adrian I. to a ſtate of entire dependence on himſelf. Adrian applied to the French monarch, the uſual reſource of the pontiffs in thoſe days. Charles was very willing to grant the neceſſary aſſiſtance, but the nobility were averſe to an Italian war; ſo that he was obliged to act with great circumſpection. Several embaſſies were therefore ſent to Didier, entreating him to reſtore to the Pope thoſe places which he had taken from him, and at laſt even offering him a large ſum of money if he would do ſo; but this propoſal being rejected, he obtained the conſent of his nobility to make war on the Lombards. Didier diſpoſed his troops in ſuch a manner, that the officers of Charles are ſaid to have been unanimouſly of opinion that it would be impoſſible to force a paſſage. This, however, was accompliſhed, either through the ſuperior ſkill of Charles, according to ſome hiſtorians, or a panic which ſeized the Lombard ſoldiers, according to others; after which, Didier, with the old duke of Aquitain, who had eſcaped from his priſon, and taken refuge at his court, ſhut themſelves up in Pavia. Adalgiſe, the only ſon of the Lombard monarch, with the widow and children of Carloman, fled to Verona. That city was immediately inveſted by the conqueror, and in a ſhort time obliged to ſubmit. Adalgiſe had the good luck to eſcape to Conſtantinople, but we are not informed what became of Carloman's widow and children.—Charles, after paying a ſhort viſit to Rome, returned to the ſiege of Pavia. The place was vigorouſly defended, until famine and peſtilence obliged the inhabitants to implore the clemency of Charles. Hunalde fell a ſacrifice to his own obſtinacy in oppoſing the intention of the people; Didier was taken priſoner and carried into France; but we are not informed of his fate afterwards. His kingdom, however, was totally diſſolved, and Charles was crowned king of Lombardy at Milan in the year 774.

Having received the oaths of allegiance from his new ſubjects, Charles ſet out for Saxony, the inhabitants of which had again revolted, and recovered Ereſbourg their capital. The king ſoon recovered this important poſt; but a detachment of his army being cut off, and new troubles ariſing in Italy, he was obliged to accept of the propoſals of the Saxons, though their ſincerity was very doubtful. Having therefore only ſtrengthened the fortifications of Ereſbourg, and left a ſufficient garriſon in the place, he ſet out for Italy, which was all in commotion through the intrigues of the emperor of the Eaſt, and Adalgiſe the ſon of Didier. The preſence of Charles reſtored tranquillity in that quarter; but in the mean time, the Saxons having taken Ereſbourg and deſtroyed the fortifications, threatened to annihilate the French power in that quarter. On the king's return, he found them employed in the ſiege of Sigebourg. His ſudden arrival ſtruck the barbarians with ſuch terror, that they inſtantly ſued for peace; which the king once more granted, but took care to ſecure their obedience by a chain of forts along the river Lippe, and repairing the fortifications of Ereſbourg. An aſſembly of the Saxon chiefs was held at Paderborn, and a promiſe was made, that the nation ſhould embrace the Chriſtian religion: after which the king ſet out on an expedition to Spain in the year 778. France.

This new enterpriſe was undertaken at the requeſt of Ibunala, the Mooriſh ſovereign of Saragoſſa, who had been driven from his territory. He was reſtored, however, by the proweſs of Charles, who reduced the cities of Pampeluna and Saragoſſa. He reduced alſo the city of Barcelona, and the kingdoms of Navarre and Arragon; but, on his return, he met with a ſevere check from the Gaſcons, who attacked and defeated the rear-guard of his army with great ſlaughter as they paſſed the Pyrenean mountains. This engagement, which ſeems to imply ſome defect in the prudence or military ſkill of Charles, has been much celebrated among romance writers, on account of the death of Roland a famous warrior.

Next year, 779, he paid a viſit to Italy with his two ſons Carloman and Louis. Having paſſed the winter at Pavia, he entered Rome next ſpring amidſt the acclamations of the inhabitants. Here, in the 39th year of his age, he divided his dominions in preſence of the pope betwixt his two ſons Carloman and Louis. The former, who now took the name of Pepin, had Lombardy; the latter Aquitian. Having then received the ſubmiſſion of Taſſilon duke of Bavaria, he ſet out for Saxony, where he took a moſt ſevere revenge on the people of that country for the many treacheries they had been guilty of. The preſent revolt was chiefly owing to a chief named Witikind, who had twice before fled from the victorious arms of Charles, and taken refuge at the court of Denmark. Returning from thence, in the king's abſence, he rouſed his countrymen to action, while the generals of Charles, diſagreeing among themſelves, neglected to take the proper methods for repelling the enemy. In conſequence of this, they were entirely defeated on the banks of the Weſer in the year 782. Charles arrived in time to prevent the total deſtruction of his people, and directly penetrated into the heart of the country. Witikind unable to reſiſt his antagoniſt, once more fled into Denmark; but 4500 of his followers periſhed at once by the hands of the executioner. An univerſal inſurrection was the conſequence of this unheard of cruelty; and though during three years the French monarch was conſtantly ſucceſsful in the field, he found it impoſſible by any force whatever to ſubdue the ſpirit

France. ſpirit of the people. At laſt therefore he was obliged to have recourſe to negotiation. Witikind and ſeveral other chiefs were invited to an interview; where Charles repreſented to them in ſuch ſtrong colours the ruin which muſt neceſſarily enſue to their country by perſiſting obſtinately in oppoſition to him, that they were induced not only to perſuade their countrymen finally to ſubmit, but to embrace the Chriſtian religion.

Charles having thus brought his affairs in Saxony to a happy concluſion, turned his arms againſt Taſſilon duke of Bavaria, who had underhand ſupported the Saxons in their revolt. Having entered his country with a powerful army in the year 787, he made ſuch rapid advances, that the total deſtruction of Taſſilon ſeemed inevitable. Charles had advanced as far as the river Lech, when Taſſilon privately entered his camp, and threw himſelf at his feet. The king had compaſſion on his faithleſs kinſman on ſeeing him in this abject poſture; but no ſooner did the traitor find himſelf at liberty, than he ſtirred up the Hunns, the Greek emperor, and the fugitive Adalgiſe, againſt the king. He fomented alſo the diſcontents of the factious nobles of Aquitain and Lombardy; but his ſubjects, fearing leſt theſe intrigues ſhould involve them in deſtruction, made a diſcovery of the whole to Charles. Taſſilon, ignorant of this, entered the diet at Ingelheim, not ſuſpecting any danger, but was inſtantly arreſted by order of the French monarch. Being brought to a trial, the proofs of his guilt were ſo apparent, that he was condemned to loſe his head: the puniſhment, however, was afterwards mitigated to perpetual confinement in a monaſtery, and the duchy of Bavaria was annexed to the dominions of Charles.

The Hunns and other enemies of the French monarch continued to proſecute their enterpriſes without regarding the fate of their aſſociate Taſſilon. Their attempts, however, only ſerved to enhance the fame of Charles. He defeated the Hunns in Bavaria, and the Greek emperor in Italy; obliging the latter to renounce for ever the fortune of Adalgiſe. The Hunns, not diſheartened by their defeat, continuing to infeſt the French dominions, Charles entered their country at the head of a formidable army; and having forced their intrenchments, penetrated as far as Raab on the Danube, but was compelled by an epidemic diſtemper to retire before he had finiſhed his conqueſt. He was no ſooner returned to his own dominions, than he had the mortification to be informed, that his eldeſt ſon Pepin had conſpired againſt his ſovereignty and life. The plot was diſcovered by a prieſt who had accidentally fallen aſleep in a church where the conſpirators were aſſembled. Being awakened by their voices, he overheard them conſulting on the proper meaſures for completing their purpoſe; on which he inſtantly ſet out for the palace, and ſummoned the monarch from his bed to inform him of the guilt of his ſon. Pepin was ſeized, but had his life ſpared, though condemned to expiate his offences by ſpending the remainder of his days in a monaſtery.

Charles was no ſooner freed from this danger than he was again called to arms by a revolt of the Saxons on the one hand, while a formidable invaſion of the Moors diſtreſſed him on the other; the Hunns at the ſame time renewing their depredations on his dominions. The king did not at preſent make war againſt the Moors; probably foreſeeing that they would be called off by their Chriſtian enemies in Spain. This accordingly happened; the victories of Alonſo the Chaſte obliged them to leave France; after which Charles marched in perſon to attack the Saxons and Hunns. The former conſented again to receive the Chriſtian religion, but were likewiſe obliged to deliver up a third part of their army to be diſpoſed of at the king's pleaſure; but the Hunns defended themſelves with incredible vigour. Though often defeated, their love of liberty was altogether invincible; ſo that the war was not terminated but by the death of the king, and an almoſt total deſtruction of the people: only one tribe could be induced to acknowledge the authority of the French monarch. France.

Theſe exploits were finiſhed betwixt the years 793 and 798: after which Charles invaded and ſubdued the iſlands of Majorca and Minorca; which the diſſenſions of the Mooriſh chiefs gave him an opportunity of doing. The ſatisfaction he felt from this new conqueſt, however, was ſoon damped by the troubles which broke out in Italy. After the death of Pope Adrian, his nephew aſpired to the papal dignity; but a prieſt named Leo being preferred, the diſappointed candidate determined on revenge. He managed matters ſo well, that his deſigns were concealed for four years. At laſt, on the day of a proceſſion, a furious aſſault was made on the perſon of Leo. The unfortunate pontiff was left for dead on the ground; but having with difficulty recovered, and made his eſcape to the Vatican, he was protected by the duke of Spoleto, at that time general of the the French forces. His cauſe was warmly eſpouſed by Charles, who invited him to his camp at Paderborn in Weſtphalia; whence he diſpatched him with a numerous guard to Rome, promiſing ſoon after to viſit that metropolis, and redreſs all grievances. His attention for the preſent, however, was called by the deſcents of the Normans on the maritime provinces of his dominions; ſo that he was obliged to defer the promiſed aſſiſtance for ſome time longer. Having conſtructed forts at the mouths of moſt of the navigable rivers, and further provided for the defence of his territories, by inſtituting a regular militia, and appointing proper ſquadrons to cruiſe againſt the invaders, he ſet out for the fourth and laſt time on a journey to Rome. Here he was received with the higheſt poſſible honours. Leo was allowed to clear himſelf by oath of the crimes laid to his charge by his enemies, while his accuſers were ſent into exile. On the feſtival of Chriſtmas, in the year 800, after Charles had made his appearance in the cathedral of St Peter, and aſſiſted devoutly at maſs, the pope ſuddenly put a crown on his head; and the place inſtantly reſounded with acclamations of "Long life to Charles the Auguſt, crowned by the hand of God! Long life and victory to the great and pacific emperor of the Romans!" His body was then conſecrated and anointed with royal unction; and after being conducted to a throne, he was treated with all the reſpect uſually paid to the ancient Cæſars; from this time alſo being honoured with the title of *Charlemagne*, or *Charles the Great*. In private converſation, however, he uſually proteſted, that he was ignorant of the pope's intention at this time; and that, had he known it, he would have diſappointed 28 He is crowned emperor of the weſt.

France. disappointed him by his abſence: but theſe proteſtations were not generally believed; and the care he took to have his new title acknowledged by the eaſtern emperors, evidently ſhowed how fond he was of it.

Charles, now raiſed to the ſupreme dignity in the weſt, propoſed to unite in himſelf the whole power of the firſt Roman emperors, by marrying Irene the empreſs of the eaſt. But in this he was diſappointed by the marriage of that princeſs by Nicephorus; however, the latter acknowledged his new dignity of Auguſtus, and the boundaries of the two empires were amicably ſettled. Charles was further gratified by the reſpect paid him by the great Haroun Al-Raſhid, caliph of the Saracens, who yielded to him the ſacred city of Jeruſalem, and holy ſepulchre there. But in the mean time his empire was threatened with the invaſion of a very formidable enemy, whom even the power of Charles would have found it hard to reſiſt. Theſe were the Normans, at this time under the government of Godfrey a celebrated warrior, and who by their adventurous ſpirit, and ſkill in maritime affairs, threatened all the weſtern coaſts of Europe with deſolation. From motives of mutual convenience a tranſitory peace was eſtabliſhed, and Charles made uſe of this interval to ſettle the final diſtribution of his dominions. Aquitain and Gaſcony, with the Spaniſh Marche, were aſſigned to his ſon Louis; Pepin had Italy confirmed to him; and to this was added the greateſt part of Bavaria, with the country now poſſeſſed by the Griſons. Charles the eldeſt had Neuſtria, Auſtraſia, and Thuringia. The donation was ſuppoſed to be rendered more authentic by the ſanction of the pope. This diviſion, however, had ſcarce taken place, when the princes were all obliged to defend their dominions by force of arms. Louis and Pepin were attacked by the Saracens, and Charles by the Sclavonians. All theſe enemies were defeated; but while Charles hoped to ſpend the ſhort remainder of his life in tranquillity, he was once more called forth to martial exertions by the hoſtile behaviour of Godfrey the Norman leader. Charles ſent him a meſſage of defiance, which was returned in the ſame ſtyle by Godfrey: but the former, by artfully fomenting diviſions among the northern powers, prevented for a while the threatened danger; but, theſe diſturbances being quelled, the Normans renewed their depredations, and Charles was obliged to face them in the field. An engagement, however, was prevented by the death of Godfrey, who was aſſaſſinated by a private ſoldier; on which the Norman army retreated, and the dominions of the empire ſtill remained free from theſe invaders. Still the latter days of Charles were embittered by domeſtic misfortunes. His favourite daughter Rotrude died, as did alſo Pepin king of Italy; and theſe misfortunes were ſoon followed by the death of his eldeſt ſon Charles. The emperor then thought proper to aſſociate his only ſurviving ſon Louis with him in the government; which was formally done at Aix-la-Chapelle. Charles himſelf ſurvived this tranſaction only a few months: his death happened on the 27th of January 814, in the 71ſt year of his age, and 47th of his reign.

29 Death of Charles the Great.

30 Extent of his territories.

By the martial achievements of this hero, the French monarchy was raiſed to its utmoſt pitch of ſplendour. He had added the province of Aquitain to the territories of his anceſtors; he had confined the inhabitants of Brittany to the ſhores of the ocean, and obliged them to ſubmit to a diſgraceful tribute. He had reduced under his dominion all that part of Spain which extends from the Pyrenees to the river Ebro, and includes the kingdoms of Rouſſillon, Navarre, Arragon, and Catalonia. He poſſeſſed Italy from the Alps to the borders of Calabria; but the duchy of Beneventum, including moſt of the preſent kingdom of Naples, eſcaped the yoke after a tranſitory ſubmiſſion. Beſides theſe extenſive countries, Charles added to his territories the whole of Germany and Pannonia; ſo that the French now had the juriſdiction of all the country from eaſt to weſt, from the Ebro in Spain to the Viſtula; and from north to ſouth, from the duchy of Beneventum to the river Eyder, the boundary between Germany and the dominions of Denmark. In acquiring theſe extenſive dominions Charles had been guilty of horrid and repeated maſſacres, for which, however, he had been in ſome meaſure excuſable by the barbarity and rebellious diſpoſition of the people with whom he had to deal, upon whom no mild meaſures would probably have had any effect. His eſtabliſhing of ſchools throughout the conquered provinces, ſhowed alſo his inclination to govern his ſubjects in peace, and to take proper ſteps for their civilization; though indeed many parts of his private conduct ſhowed no ſmall inclination to cruelty; particularly the fate of the ſons of Carloman, of whom no account could ever be obtained. His advice to his ſon Louis indeed was excellent; exhorting him to conſider his people as his children; to be very mild and gentle in his adminiſtration, but firm in the execution of juſtice; to reward merit; promote his nobles gradually; chooſe miniſters deliberately, but not remove them capriciouſly or without ſufficient reaſon. All theſe prudent maxims, however, were not ſufficient to enable Louis to govern dominions ſo extenſive, and people ſo turbulent as he had to deal with. At the time of the deceaſe of his father this prince was about 36 years of age, and had married Ermengarde, daughter of the count of Heſbai of the dioceſe of Liege, by whom he had three ſons, Lothaire, Pepin, and Louis. Lothaire, the eldeſt, was aſſociated with himſelf in the empire, and the two youngeſt were intruſted with the governments of Aquitain and Bavaria. Every one of the princes proved unfaithful to their father, as well as enemies to one another. The death of Ermengarde, and the marriage of the emperor with Judith a princeſs of Bavaria, artful but accompliſhed, proved the firſt ſource of calamity to the empire. In the year 823, Charles, the emperor's youngeſt ſon, was born; and his pretenſions became in time more fatal to the public tranquillity than the ambition and diſobedience of all the reſt. Various parts of the Imperial dominions were likewiſe aſſaulted by foreign enemies. The inhabitants of Brittany and Navarre revolted; the Moors invaded Catalonia; while the ambition of Judith produced a war amongſt the brothers themſelves.

31 Decline of his empire.

Charles at firſt had been appointed ſovereign of that part of Germany bounded by the rivers Danube, the Maine, the Neckar, and the Rhine; the country of the Griſons and Burgundy, comprehending Geneva and the Swiſs cantons; but this was oppoſed by the three elder ſons. Pepin and Louis advanced with the united forces of Aquitain and Bavaria, while the Im-

32 Civil wars among the ſons of Louis the Gentle.

perial

France. perial forces deſerted their ſtandard and joined the malecontents. The emperor was taken priſoner, and the empreſs retired to a monaſtery. Lothaire, the eldeſt of the younger princes, to whom the reſt found themſelves obliged to ſubmit, was the perſon who retained the emperor in his poſſeſſion; but, notwithſtanding his breach of duty, his heart was touched with remorſe on account of the crimes he had committed. Dreading the reproach of the world at large, and being threatened with the cenſures of the church, he threw himſelf at his father's feet, and begged pardon for his guilt, conſenting to relinquiſh the authority he had unjuſtly uſurped. Thus Louis was reeſtabliſhed in his authority by the diet of the empire which had met to depoſe him. His firſt ſtep was to recal his empreſs from the monaſtery to which ſhe had retired; but this princeſs, implacable in her reſentment, now perſecuted Lothaire to ſuch a degree, that he was obliged to join his two brothers Pepin and Louis in a confederacy againſt their father. The old emperor thought to check this rebellious diſpoſition by revoking his grant of Aquitain to Pepin, and conferring it on his youngeſt ſon Charles, then only nine years of age; but Pope Gregory IV. conferred the Imperial dignity itſelf on Lothaire, depoſing the unhappy monarch, and again ſending the empreſs to a nunnery in the foreſt of Arden. The unnatural behaviour of his ſon, however, once more excited the compaſſion of his ſubjects. Dreux, the biſhop of Mentz, uſed his intereſt with Louis king of Bavaria to arm his ſubjects in defence of his father and ſovereign. In this enterpriſe the Bavarian monarch was joined by the French and Saxons; ſo that the aged emperor was once more reſtored, the empreſs releaſed from her nunnery, and Charles from his priſon, in the year 833.

The ambition of Judith now ſet matters once more in a flame. Taking advantage of the affection her huſband bore her, ſhe perſuaded him to inveſt her ſon Charles with the ſovereignty of Neuſtria as well as the dominions formerly aſſigned him. This was productive of great diſcontent on the part of Lothaire and Pepin; but their power was now too much broken to be able to accompliſh any thing by force of arms. The depth of Pepin, which happened ſoon after, produced a new diviſion of the empire. The claims of young Pepin and Charles, ſons of the deceaſed prince, were entirely diſregarded, and his French dominions divided between the two brothers Charles and Lothaire, the latter being named guardian to his infant nephew. This enraged Louis of Bavaria, whoſe intereſt was entirely neglected in the partition, to ſuch a degree, that he again revolted; but the unexpected appearance, with the hoſtile preparations of the Saxons, obliged him to ſubmit and aſk pardon for his offences. Still, however, the ambition of the empreſs kept matters in a continual ferment, and the empire was again threatened with all the calamities of civil war; but before theſe took place, the emperor died, in 841, after a moſt unfortunate reign of 27 years.

Louis was eminent for the mildneſs of his manners and peaceful virtues, which procured him the title of *Le Debonnaire*, or, "the gentle:" but ſuch was the turbulence and exceſſive barbarity of the age in which he lived, that all his virtues, inſtead of procuring him reſpect and eſteem, were productive only of contempt and rebellion from thoſe whom both duty and nature ought to have rendered the moſt ſubmiſſive and obedient. France.

The deceaſe of the emperor was followed by a civil war among his ſons. The united forces of Lothaire and his nephew Pepin were defeated by thoſe of Charles and Louis in a very bloody battle in the plains of Fontenoy, where 100,000 Franks periſhed, in the year 842. This victory, however, bloody as it was, did not decide the fortune of the war. The conquerors having, through motives of intereſt or jealouſy, retired each into their own dominions, Lothaire found means not only to recruit his ſhattered forces, but preſſed the other two princes ſo vigorouſly, that they were glad to conſent to a new partition of the empire. By this Lothaire was allowed to poſſeſs the whole of Italy, with the whole tract of country between the rivers Rhone and Rhine, as well as that between the Meuſe and Scheldt. Charles had Aquitain, with the country lying between the Loire and the Meuſe; while Louis had Bavaria, with the reſt of Germany, from whence he was diſtinguiſhed by the appellation of *Louis the German*.

33 Diviſion of the empire.

By this partition, Germany and France were diſjoined in ſuch a manner as never afterwards to be united under one head. That part of France which was allowed to Lothaire, was from him called *Lotharingia*, and now *Lorrain*, by the gradual corruption of the word. The ſovereignty, however, which that prince had purſued at the expence of every filial duty, and purchaſed with ſo much blood, afforded him now but little ſatisfaction. Diſguſted with the cares and anxieties of his ſituation, he ſought relief in a monaſtery in the year 855. On his retreat from the throne, he allotted to his eldeſt ſon Louis II. the ſovereignty of Italy; to his ſecond ſon Lothaire the territory of Lorrain, with the title of king; and to his youngeſt ſon Charles, ſurnamed the *Bald*, Provence, Dauphiny, and part of the kingdom of Burgundy; ſo that he may be conſidered as properly the king of France.

34 Lothaire reſigns.

35 Reign of Charles the Bald.

From the year 845 to 857 the provinces ſubjected to his juriſdiction had been infeſted by the annual depredations of the Normans, from whom Charles was at laſt fain to purchaſe peace at a greater expence than might have carried on a ſucceſsful war. The people of Brittany had alſo revolted; and though obliged by the appearance of Charles himſelf, at the head of a powerful army, to return to their allegiance, they no ſooner perceived him again embarraſſed by the incurſions of the Normans, than they threw off the yoke, and under the conduct of their duke Louis ſubdued the neighbouring dioceſe of Rennes; after which exploit Louis aſſumed the title of king, which he tranſmitted to his ſon Heriſpec. By him Charles was totally defeated; and his ſubjects, perceiving the weakneſs of their monarch, put themſelves under the protection of Louis the German. His ambition prompted him to give a ready ear to the propoſal; and therefore, taking the opportunity of Charles's abſence in repelling an invaſion of the Danes, he marched with a formidable army into France, and was ſolemnly crowned by the archbiſhop of Sens in the year 857. Being too confident of ſucceſs, however, and fancying himſelf already eſtabliſhed on the throne, he was perſuaded

France. to diſmiſs his German forces; which he had no ſooner done, than Charles marched againſt him with an army, and Louis abandoned his new kingdom as eaſily as he had obtained it.

Notwithſtanding this ſucceſs, the kingdom of Charles continued ſtill in a very tottering ſituation. The Normans haraſſed him in one quarter, and the king of Brittany in another. He marched againſt the latter in the year 860; but had the misfortune to receive a total defeat, after an engagement which laſted two days. The victory was chiefly owing to a noted warrior named Robert le Fort, or the Strong, who commanded the Bretons; but Charles found means to gain him over to his party, by inveſting him with the title of duke of France, including the country which lies between the rivers Seine and Loire.

For ſome time the abilities of Robert continued to ſupport the tottering throne of Charles; but the difficulties returned on the death of that hero, who was killed in repelling an invaſion of the Danes. Some amends was indeed made for his loſs by the death of the king of Lorrain in the year 869; by which event the territories of Charles were augmented by the cities of Lyons, Vienne, Toul, Beſançon, Verdun, Cambray, Viviers and Urez, together with territories of Hainault, Zealand, and Holland. Cologne, Utrecht, Treves, Mentz, Straſburg, with the reſt of the territories of Lothaire, were aſſigned to Louis the German.

All this time the Normans ſtill continued their incurſions to ſuch a degree, that Solomon king of Brittany was perſuaded to join his forces to thoſe of Charles, in order to repel the common enemy. The event proved unfortunate to the Normans; for their principal leaders were beſieged in Angiers, and obliged to purchaſe leave to depart by relinquiſhing all the ſpoil they had taken. Charles thus freed from a formidable enemy, began to aſpire to the Imperial crown, which about this time became vacant by the death of Louis. This belonged of right to Louis the German; but Charles, having inſtantly aſſembled a powerful army, marched with it into Italy before Louis could be appriſed of his deſigns; and being favourably received at Rome, the Imperial crown was put on his head without any heſitation by the pope, in the year 873. Louis, enraged at his diſappointment, diſcharged his fury on the defenceleſs country of Champagne; and though the approach of Charles obliged him for the preſent to retire, yet he continued his preparations with ſuch vigour, that Charles would in all probability have found him a very formidable adverſary, had he not been taken off by death in the year 877. Charles was no ſooner informed of his brother's deceaſe, than he invaded the dominions of his ſon Louis, who poſſeſſed Franconia, Thuringia, the Lower Lorrain, with ſome other territories in that quarter. The enterpriſe, however, proved unſucceſsful. Charles, though ſuperior in numbers, was defeated with great ſlaughter, and had ſcarcely time to reunite his ſcattered forces, when he was informed that the Normans had invaded his territories, laid waſte part of that country, and taken poſſeſſion of the city of Rouen. So many diſaſters affected him in ſuch a manner that he fell dangerouſly ill, and was ſcarcely recovered of his ſickneſs when he found himſelf called into Italy to the aſſiſtance of the pope againſt the Saracens, whoſe invaſions were encouraged by the duke of Beneventum and the Greek emperor. Charles paſſed into Italy with only a few followers; but when he came to Pavia, at which place the pontiff had appointed to meet him, he was informed that Carloman king of Bavaria, and ſon of Louis the German, was already in Italy with a powerful army, and laid claim to the imperial title in virtue of his father's right. Charles prepared to oppoſe him by force of arms; but his generals conſpired againſt him, and the ſoldiers declared their reſolution not to paſs the Alps. On this he was obliged to retire to France, at the very moment that Carloman, dreading his power, prepared to return to Germany. This was the laſt of Charles's enterpriſes. His journey brought on a return of his indiſpoſition, which was rendered fatal through the treachery of a Jewiſh phyſician named Zedechius, who adminiſtered poiſon to him under pretence of curing his malady. He expired in a miſerable cottage upon Mount Cenis, in the 54th year of his age, and 38th of his reign over the kingdom of France. France. 36 He is poiſoned.

37 The ambition of Charles had been productive of much diſtreſs both to himſelf and to his ſubjects. His ſon Louis, ſurnamed, from a defect in his ſpeech, *the Stammerer*, was of a quite different diſpoſition; but his feeble adminiſtration was ill calculated to retrieve matters in their preſent ſituation. He died on the 10th of April 879, while on a march to ſuppreſs ſome inſurrections in Burgundy. He left his queen Adelaide pregnant; who ſome time after his deceaſe was delivered of a ſon, named *Charles*. After his death followed an interregnum; during which a faction was formed for ſetting aſide the children of Louis the Stammerer, in favour of the German princes, ſons to Louis the brother of Charles the Bald. This ſcheme, however, proved abortive; and the two ſons of the late king, Louis and Carloman, were crowned kings of France. Another kingdom was at that time erected by an aſſembly of the ſtates, namely, the kingdom of Provence, which conſiſted of the countries now called *Lyonnois*, *Savoy*, *Dauphiny*, *Franche Compte*, and part of the duchy of Burgundy; and the kingdom was given to Duke Boſon, brother-in-law to Charles the Bald. In 881, both kings of France died; Louis, as was ſuſpected, by poiſon; and Carloman of a wound he received accidentally while hunting. This produced a ſecond interregnum; which ended with the calling in of Charles the Groſs, emperor of Germany. His reign was more unfortunate than that of any of his predeceſſors. The Normans, to whom he had given leave to ſettle in Frieſland, ſailed up the Seine with a fleet of 700 ſhips, and laid ſiege to Paris. Charles, unable to force them to abandon their undertaking, prevailed on them to depart by a large ſum of money. But as the king could not advance the money at once, he allowed them to remain in the neighbourhood of Paris during the winter; and they in return plundered the country, thus amaſſing vaſt wealth beſides the ſum which Charles had promiſed. After this ignominious tranſaction Charles returned to Germany, in a very declining ſtate of health both as to body and mind. Here he quarrelled with his empreſs; and being abandoned by all his friends, he was depoſed, and reduced to ſuch diſtreſs, that he would not even have had bread to eat, Reign of Louis the Stammerer.

France. had he not been fupplied by the archbifhop of Mentz, out of the principle of charity.

On the depofition of Charles the Grofs, Eudes count of Paris was chofen king by the nobility during the minority of Charles the fon of Adelaide, afterwards named *Charles the Simple*. He defeated the Normans, and repreffed the power of the nobility; on which account a faction was formed in favour of Charles, who was fent for, with his mother, from England. Eudes did not enter into a civil war; but peaceably refigned the greateft part of the kingdom to him, and confented to do homage for the reft. He died foon after this agreement, in the year 898.

During the reign of Charles the Simple, the French government declined. By the introduction of fiefs, thofe noblemen who had got into the poffeffion of governments, having thefe confirmed to them and their heirs for ever, became in a manner independent fovereigns; and as thefe great lords had others under them, and they in like manner had others under them, and even thefe again had their vaffals; inftead of the eafy and equal government which prevailed before, a vaft number of infupportable little tyrannies was erected. The Normans, too, ravaged the country in the moft terrible manner, and defolated fome of the fineft provinces in France. At laft Charles ceded to Rollo, the king or captain of thefe barbarians, the duchy of Neuftria; who thereupon became a Chriftian, changed his own name to *Robert*, and that of his principality to *Normandy*.

During the remainder of the reign of Charles the Simple, and the entire reign of Lous IV. furnamed the *Stranger*, Lothaire, and Louis V. the power of the Carlovingian race continually declined; till at laft they were fupplanted by Hugh Capet, who had been created duke of France by Lothaire. This revolution happened in the year 987, and was brought about much in the fame manner as the former one had been by Pepin. He proved an active and prudent monarch, and poffeffed fuch other qualities as were requifite for keeping his tumultuous fubjects in awe. He died on the 24th of October 997, leaving his dominions in perfect quiet to his fon Robert.

38 Family of Charles the Great fupplanted by Hugh Capet.

39 Robert. The new king inherited the good qualities of his father. In his reign the kingdom was enlarged by the death of Henry duke of Burgundy, the king's uncle, to whom he fell heir. This new acceffion of territory, however, was not obtained without a war of feveral years continuance, on account of fome pretenders to the fovereignty of that duchy; and had it not been for the affiftance of the duke of Normandy, it is doubtful whether the king would have fucceeded.—As Robert was of opinion, that peace and tranquillity were preferable to wide extended dominions with a precarious tenure, he refufed the kingdom of Italy and imperial crown of Germany, both which were offered him. He died on the 20th of July 1030; having reigned 33 years, and lived 60.

40 Henry I. Robert was fucceeded by his eldeft fon Henry I. who in the beginning of his reign met with great oppofition from his mother. She had always hated him; and preferred his younger brother Robert, in whofe favour fhe now raifed an infurrection. By the affiftance of Robert duke of Normandy, however, Henry overcame all his enemies, and eftablifhed himfelf firmly upon the throne. In return for this, he fupported William, Robert's natural fon, and afterwards king of England, in the poffeffion of the duchy of Normandy. Afterwards, however, growing jealous of his power, he not only fupported the pretenders to the duchy of Normandy fecretly, but invaded that country himfelf in their favour. This enterprife proved unfuccefsful, and Henry was obliged to make peace: but no fincere reconciliation ever followed; for the king retained a deep fenfe of the difgrace he had met with, and the duke never forgave him for invading his dominions. The treaty between them, therefore, was quickly broken; and Henry once more invaded Normandy with two armies, one commanded by himfelf, and the other by his brother. The firft was haraffed by continual fkirmifhes, and the laft totally defeated; after which Henry was obliged to agree to fuch terms as the duke thought proper: but the rancour between them never ceafed, and was in reality the caufe of that implacable averfion which for a long feries of years produced perpetual quarrels between the kings of France and thofe of the Norman race in England. France.

41 Philip. Henry died in 1059, not without a fufpicion of being poifoned; and was fucceeded by his eldeft fon Philip, at that time in the eighth year of his age. Baldwin earl of Flanders was appointed his guardian; and died in the year 1066, about the time that William of Normandy became king of England. After the death of his tutor, Philip began to fhow a very infincere, haughty, and oppreffive difpofition. He engaged in a war with William the Conqueror, and fupported his fon Robert in his rebellion againft him §. But after the death of William, he affifted Robert's brothers againft him; by which means he was forced to confent to a partition of his dominions. § See *England*, N° 89.

In 1092, King Philip being wearied of his queen Bertha, procured a divorce from her under pretence of conſanguinity, and afterwards demanded in marriage Emma daughter to Roger count of Calabria. The treaty of marriage was concluded; and the princefs was fent over, richly adorned with jewels, and with a large portion in ready money: but the king, inftead of efpoufing her, retained her fortune, and difmiffed the princefs herfelf, carrying off from her hufband the countefs of Anjou, who was eſteemed the handſomeſt woman in France. With her he was fo deeply enamoured, that not fatisfied with the illegal poffeffion of her perfon, he procured a divorce between her and her hufband, and prevailed upon fome Norman bifhops to folemnize his own marriage with her. The whole of thefe tranſactions, however, were fo fcandalous, that the pope having caufed them to be reviſed in a council at Autun, in the year 1094, pronounced ſentence of excommunication againft Philip in caſe he did not part with the countefs. On his repentance, the cenſure was taken off; but as the king paid no regard to his promiſes, he was, in 1095, excommunicated a ſecond time. He again profeffed repentance, and was abſolved; but ſoon after, living with the countefs of Anjou as formerly, he was excommunicated a third time. This conduct, ſo unworthy of a prince, expoſed him to the contempt of the people. Too many of the nobility followed his example, and at the ſame time deſpiſed his authority; not only making war upon

France. on each other, but ſpoiling and robbing his ſubjects with impunity.

In the year 1110, Philip prevailed on the court of Rome to have his affair reviewed in an aſſembly at Poictiers; where, notwithſtanding his utmoſt efforts, ſentence of excommunication was a fourth time pronounced againſt him. Yet, in ſpite of all theſe ſentences, as Queen Bertha was dead, and the count of Anjou offered, for a large ſum of money, to give whatever aſſiſtance was requiſite for procuring a diſpenſation, Philip at laſt prevailed, and the counteſs was proclaimed queen of France. But though the king's domeſtic affairs were now in ſome meaſure quieted, his negligence in government had thrown the affairs of the nation into the greateſt diſorder. He therefore aſſociated with him in the government his eldeſt ſon Louis. This prince was the very reverſe of his father; and by his activity and reſolution, keeping conſtantly in the field with a conſiderable body of forces, he reduced the rebellious nobility to ſubjection, and according to the beſt hiſtorians, at this time ſaved the ſtate from being utterly ſubverted.

For theſe ſervices the queen looked upon the young prince with ſo jealous an eye, and gave him ſo much diſturbance, that he found it neceſſary to retire for ſome time into England; where he was received by King Henry I. with the greateſt kindneſs. He had not been long at court, before Henry received by an expreſs a letter from Philip; telling him, that, for certain important reaſons, he ſhould be glad if he cloſely confined his ſon, or even deſpatched him altogether. The king of England, however, inſtead of complying with this infamous requeſt, ſhowed the letter to Louis, and ſent him home with all imaginable marks of reſpect. Immediately on his return, he demanded juſtice; but the queen procured poiſon to be given him, which operated ſo violently that his life was deſpaired of. A ſtranger, however, undertook the cure, and ſucceeded; only a paleneſs remained in the prince's face ever afterwards, though he grew ſo fat that he was ſurnamed *the Groſs*.

On his recovery, the prinec was on the point of revenging his quarrel by force of arms; but his father having cauſed the queen to make the moſt humble ſubmiſſions to him, his reſentment was at length appeaſed, and a perfect reconciliation took place.

42 Louis the Groſs.

Nothing memorable happened in the reign of King Philip after this reconciliation. He died in the year 1108, and was ſucceeded by his ſon Louis the Groſs. The firſt years of his reign were diſturbed by inſurrections of his lords in different places of the kingdom; and theſe inſurrections were the more troubleſome, as they were ſecretly fomented by Henry I. of England, that by weakening the power of France his duchy of Normandy might be the more ſecure. This quickly brought on a war; in which Henry was defeated, and his ſon William obliged to do homage to Louis for the duchy of Normandy. As the kings of England and France, however, were rivals, and exceedingly jealous of each other, the latter eſpouſed the cauſe of William the ſon of Robert duke of Normandy, whom Henry had unjuſtly deprived of that duchy. This brought on a new war; in which Louis, receiving a great defeat from Henry, was obliged to make peace upon ſuch terms as his antagoniſt thought proper. The tranquillity, however, was but of ſhort duration. Louis renewed his intrigues in favour of William, and endeavoured to form a confederacy againſt Henry; but the latter found means not only to diſſipate this confederacy, but to prevail upon Henry V. emperor of Germany to invade France with the whole ſtrength of the empire on one ſide, while he prepared to attack it on the other. But Louis having collected an army of 200,000 men, both of them thought proper to deſiſt. Upon this the king of France would have marched into Normandy, in order to put William in poſſeſſion of that duchy. His great vaſſals, however, told him they would do no ſuch thing; that they had aſſembled in order to defend the territories of France from the invaſion of a foreign prince, and not to enlarge his power by deſtroying that balance which aroſe from the king of England's poſſeſſion of Normandy, and which they reckoned neceſſary for their own ſafety. This was followed by a peace with Henry; which, as both monarchs had now ſeen the extent of each other's power, was made on pretty equal terms, and kept during the life of Louis, who died in 1137, leaving the kingdom to his ſon Louis VII. France.

43 Louis VII. a weak prince.

The young king was not endowed with any of thoſe qualities which conſtitute a great monarch. From the ſuperſtition common to the age in which he lived, he undertook an expedition into the Holy Land, from whence he returned without glory. In this expedition he took his queen Eleanor along with him; but was ſo much offended with her gallantries during her ſtay there, as well as her behaviour afterwards, that he divorced her, and returned the duchy of Guienne which he received with her as a portion. Six weeks after this ſhe married Henry duke of Normandy, count of Anjou and Maine, and heir apparent to the crown of England. This marriage was a very great mortification to Louis; and procured him the ſurname of *the Young*, on account of the folly of his conduct. When Henry aſcended the throne of England, ſome wars were carried on between him and Louis, with little advantage on either ſide: at laſt, however, a perfect reconciliation took place; and Louis took a voyage to England, in order to viſit the ſhrine of St Thomas of Canterbury. On his return he was ſtruck with an apoplexy; and though he recovered for that time, yet he continued ever after paralytic on the right ſide. After having languiſhed for about a year under this malady, he died on the 18th of September 1180, leaving the kingdom to his ſon Philip.

44 Philip the Great.

This prince, ſurnamed *The Gift of God*, *The Magnanimous*, and *The Conqueror*, during his lifetime; and, as if all theſe titles had fallen ſhort of his merit, ſtyled *Auguſtus* after his death,—is reckoned one of the greateſt princes that ever ſat on the throne of France, or any other. It doth not, however, appear that theſe titles were altogether well founded. In the beginning of his reign he was oppoſed by a ſtrong faction excited by his mother. This indeed he ſuppreſſed with a vigour and ſpirit which did him honour; but his taking part with the children of Henry II. of England in their unnatural conteſts with their father, and his treacherous combination with John to ſeize his brother's kingdom when he was detained in priſon by the emperor of Germany, muſt be indelible ſtains in his

France. character, and for ever exclude him from the title of *Magnanimous*. As to military ſkill and perſonal valour, he was evidently inferior to Richard I. of England; nor can his recovering of the provinces held by the Engliſh in France, from ſuch a mean and daſtardly prince as King John, entitle him with any juſtice to the ſurname of *Conqueror*. In politics he was evidently the dupe of the pope, who made uſe of him to intimidate John into a ſubmiſſion, by promiſing him the kingdom of England, which he never meant that he ſhould enjoy. An account of theſe tranſactions, which are the principal ones of this reign, is given under the article ENGLAND, N° 121—141.

45 Reign of Louis IX. Philip died in 1223, and was ſucceeded by his ſon Louis VIII. and he, in 1226, by Louis IX. afterwards ſtyled *St Louis*. This prince was certainly poſſeſſed of many good qualities, but deeply tinctured with the ſuperſtition of the times. This induced him to engage in two croiſades. The firſt was againſt the Saracens in Egypt: in which he was taken priſoner by the Infidels, and treated with great cruelty; but at laſt obtained his ranſom, on condition of paying a million of pieces of gold, and ſurrendering the city of Damietta. He no ſooner regained his liberty, than he entered Syria with a view of doing ſomething worthy of his rank and character. From this expedition he was obliged to return ſooner than he intended, by the news of the deceaſe of his mother Queen Blanch, whom he had appointed regent in his abſence, and who had managed the national affairs with the greateſt prudence. The king, however, found many diſorders in the kingdom upon his return; and theſe he ſet himſelf to reform with the utmoſt diligence. Having ſucceeded in this, he yielded to Henry III. of England, the Limouſin, Querci, Perigord, and ſome other places; in conſideration of Henry and his ſon Prince Edward their renouncing, in the fulleſt manner, all pretenſions to Normandy and the other provinces of France which the Engliſh had formerly poſſeſſed.

The reputation of this monarch for candour and juſtice was ſo great, that the barons of England, as well as King Henry III. conſented to make him umpire of the differences which ſubſiſted between them. But though he decided this matter very juſtly, his deciſion was not productive of any good effect. At laſt the king, having ſettled every thing relating to his kingdom in a proper manner, ſet out on another croiſade for Africa; where he died of the plague, on the 25th of Auguſt 1270.

46 Philip the Hardy. Notwithſtanding the misfortunes of Louis, his ſucceſſor Philip, ſurnamed *the Hardy*, continued the war againſt the Infidels with great vigour. Being reinforced by his uncle Charles king of Sicily, he brought the war to a more fortunate concluſion than his predeceſſor had been likely to do. The Saracens were defeated in two engagements, and the king of Tunis obliged to ſue for peace; offering at the ſame time to double the tribute he formerly paid to the crown of Sicily; to reimburſe the expences of the war; and to permit the Chriſtian religion to be freely propagated throughout his dominions. Having accompliſhed this, the two princes ſet ſail for Europe; but the ſeeds of the diſtemper which had infected the army in Africa not being eradicated, broke forth on their arrival in Sicily, and raged for ſome time with great violence. Beſides a vaſt number of common people, the king's France. brother John, his queen Iſabella, with his brother and ſiſter-in-law the king and queen of Navarre, and his uncle and aunt the count and counteſs of Poictiers, periſhed by this dreadful malady.

On his return to France, Philip took poſſeſſion of the counties of Provence and Thoulouſe; married his ſecond ſon, though then very young, to the only daughter of the king of Navarre; while he himſelf eſpouſed Mary the daughter of the duke of Brabant, reckoned one of the moſt beautiful princeſſes of the age. He ſteadily enforced the regulations of his predeceſſor, who had prohibited the barons from making private wars upon one another; procured the friendſhip of Edward I. of England by ceding to him the county of Agenois; and entered into a war with Spain in order to ſupport the pretenſions of his nephews, the Infants de la Cerda, to the throne of Caſtile.

The events of this war were of no great importance; and the king's attention was quickly called off from them by the death of his eldeſt ſon Louis at the age of twelve years. This diſaſtrous event happened in the year 1275, not without a ſuſpicion of poiſon; and the young queen, Mary, was accuſed by a ſurgeon named La Broſſe as guilty of his death. Philip gave ſome credit to the accuſation: but having applied to a nun, who pretended to be inſpired, for full ſatisfaction, her anſwer proved fatal to La Broſſe. The queen being cleared by this pretended prophetes, La Broſſe was accuſed of a treaſonable correſpondence with the king of Caſtile, and condemned to death. The manner of his trial and execution, however, were ſuch, that the tide of popular favour was turned; La Broſſe was by the voice of the people declared to be innocent, and the king and queen themſelves loudly condemned. During theſe unfavourable circumſtances, the Sicilians, over whom Charles of Anjou had eſtabliſhed his authority, inſtigated by John of Procida, a noble exile, came to a reſolution of freeing themſelves at once from the French yoke by a general maſſacre. This cruel reſolution was accordingly put in execution; and the French, to the number of 8000, murdered in one night; after which Peter of Arragon, ſailed to the iſland, where he was received by the inhabitants as their king and ſaviour. Charles was ſenſibly affected by this misfortune: and having laid ſiege to Meſſina, ſailed directly to Marſeilles, where he obtained a powerful reinforcement. But during his abſence on this occaſion, his ſon, to whom he had entruſted the care of the ſiege, having raſhly ventured an engagement with the Spaniſh fleet, was entirely defeated and taken priſoner; which ſo much affected the father that he died of grief, and Sicily was inſeparably attached to the houſe of Arragon. 47 French maſſacred in Sicily.

The misfortunes of Charles were followed by others equally great to Philip himſelf. Pope Martin IV. in the warmth of his zeal for the cauſe of the duke of Anjou, had excommunicated Pedro king of Arragon, and beſtowed his kingdom on Charles of Valois, a younger ſon of the king of France. In attempting to defend himſelf againſt the execution of this unjuſt ſentence, Pedro was mortally wounded; but, ſoon after, the French fleet being defeated by that of Arragon, the king was ſo much affected by the misfortune that he fell ſick. His diſeaſe was augmented by the heat

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heat of the climate and the fatigues of war; ſo that, quite worn out with grief and infirmities, he expired at Perpignan in the 41ſt year of his age, and 16th of his reign.

48 Reign of Philip the Fair.

By the death of Philip the Hardy the French crown devolved on his ſecond ſon, called alſo Philip, and from the beauty of his perſon ſurnamed *the Fair;* who had eſpouſed the princeſs of Navarre, and at the time of his acceſſion was in his 17th year. By the marriage with this princeſs he had obtained the counties of Champagne and Brie; yet with all this increaſe of power he found himſelf unable to ſupport the war in which his predeceſſor had engaged. For this reaſon he thought proper to abandon the intereſt of the Infants de la Cerda, and ſettle the differences with Caſtile. The treaty was concluded by the mediation of Edward I. of England; at whoſe interceſſion Charles the Lame, ſon to the duke of Anjou already mentioned, was releaſed from his captivity; Edward himſelf paying part of his ranſom. On this Charles conſented to renounce his claim on Sicily; and Philip himſelf promiſed that his kinſman Philip of Valois ſhould renounce all pretenſions to the crown of Arragon. In return for this generoſity, the latter obtained the eldeſt daughter of Charles, with the territories of Anjou, and Maine as a dowry.

The tranquillity procured by this treaty, however, was ſoon interrupted by differences with Edward the promoter of it; Pope Boniface VIII. and Guy de Dampier, count of Flanders. The difference with England took place by a mere accident. A Norman and an Engliſh veſſel having met off the coaſt of Bayonne, and having both occaſion for water, the crews met and quarrelled at the ſame ſpring. A Norman was killed in the ſquabble by his own weapon, with which he aſſaulted an Engliſhman, as the latter pretended: but however the matter was, complaints were made by the Normans to Philip; who, without giving himſelf much trouble to inquire into the merits of the cauſe, inſtantly allowed them to redreſs their ſuppoſed injuries. On this a kind of piratical war commenced between the two nations, in which the two ſovereigns for ſome time took no active part; though other nations interfered; the Iriſh and Dutch ſeamen ſiding with the Engliſh, and thoſe of Flanders and Genoa with the French. Thus the powers on both ſides were gradually augmented, till at laſt the affair became ſo ſerious, that in one engagement 15,000 French are ſaid to have periſhed. Philip, alarmed at ſuch a carnage, ſummoned the king of England as his vaſſal to attend; and, on his refuſal, declared his eſtates in France to be forfeited. After a number of negotiations, Philip declared that he would be ſatisfied with the nominal ceſſion of the province of Guienne, which he engaged inſtantly to reſtore to the king of England as ſoon as it ſhould be put into his hands. Edward complied with his demands; but no ſooner had the French monarch obtained poſſeſſion of that country, than he perſiſted in the forfeiture of the Engliſh poſſeſſions in France; which treacherous proceeding inſtantly produced a war betwixt the two nations. Edward, that he might defend himſelf the better againſt ſuch a formidable adverſary, concluded a treaty with the emperor Adolphus, together with the counts of Brittany, Holland, Bar, Juliers, Gueldres, and Flanders; while Philip ſtrengthened himſelf by an alliance with John Baliol of Scotland; and thus laid the foundation of that ſtrict union which took place between France and Scotland for two centuries. During this war the French made a deſcent on the coaſt of England, and deſtroyed the town of Dover; while Edward, in revenge, landed in Gaſcony with an army of 50,000 men. No great exploits, however, were performed with this mighty armament; and both parties finding themſelves pretty equally matched, conſented to a ſuſpenſion of arms for two years; during which a peace was finally concluded by the mediation of Pope Boniface VIII. Guienne was reſtored: Edward eſpouſed Margaret the ſiſter of Philip; while his daughter Iſabella was given in marriage to the prince of Wales.

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49 Difference with England.

50 Peace concluded.

Both Philip and Edward behaved to the allies whom they had engaged in their cauſe with equal perfidy. Baliol was abandoned by Philip to the reſentment of Edward; while Guy, earl of Flanders, was left equally expoſed to the reſentment of Philip.

51 Difference with Pope Boniface.

The reconciliation betwixt the French and Engliſh monarchs was ſoon followed by a difference with Pope Boniface, whom they had appointed mediator between them. Senſible of his aſſuming diſpoſition, however, they had inſerted in the reference made to him, that he was choſen as a private man, and not as the ſucceſſor of St Peter. The haughty pontiff, however, ſoon ſhowed, that he was not by any means to be treated as a private perſon, and a conteſt with Philip quickly enſued. Boniface began with forbidding the clergy to grant the king any ſubſidies without firſt obtaining the conſent of the Holy See, under the pain of excommunication. Philip revenged himſelf by prohibiting any eccleſiaſtics from ſending money out of the kingdom without his leave, and by protecting the Colonnas, who were the implacable enemies of Boniface. By this his holineſs was ſo much irritated that he ſent a moſt abuſive letter to Philip; after which he ſummoned the clergy of France to a council at Rome; which Philip retaliated, by ſeizing the temporalities of thoſe who obeyed the ſummons, and recalling his brother Charles of Valois, who had the title of the *Pope's General.* Senſible, however, of the danger that attended this conteſt, he deſpatched two emiſſaries, under pretence of conciliating the differences, to levy ſuch a body of troops as might execute his hoſtile purpoſes againſt the holy father. With theſe he ſuddenly inveſted the pope in his native city of Anegnia; and while the bull was preparing for the excommunication of Philip, and releaſing his ſubjects from their obedience, the pope himſelf was obliged to ſurrender priſoner to the troops of the prince whom he deſigned to anathematize.

Though Boniface had been at this time delivered up to the troops of Philip through the treachery of the people of Anegnia, yet he was no ſooner taken priſoner and brought to diſtreſs, than they reſcued him from his guards and conveyed him to Rome, where he ſoon after died of grief and ſhame. His ſucceſſor Benedict revoked the excommunication of Boniface, and attempted to regain the allegiance of Philip by gentle means: but, before this could be effected, he himſelf was cut off by death, not without ſtrong ſuſpicions of poiſon. After his deceaſe Philip offered to procure

52 Death of Boniface.

the

France. the papal chair for Bertrand archbiſhop of Bourdeaux, provided he would condemn the memory of Boniface, reſtore the honours and eſtates of the Colonnas which had been forfeited, allow him, for five years, the tenths of the clergy of France, and comply with a requeſt which at that time it was not proper to divulge.

Bertrand having complied with the terms propoſed by the king, aſcended the papal throne by the name of *Clement V.* but narrowly eſcaped being killed on his return from the cathedral of Lyons, by the falling of a wall which had been overloaded by the number of people who came to ſee the proceſſion; by which accident the duke of Brittany was killed, and the king and count of Valois conſiderably bruiſed. The new pope fixed his reſidence at Avignon, where he punctually complied with all the conditions of the treaty, except that of condemning the conduct of Boniface, which he abſolutely refuſed to do; and, inſtead of doing ſo, vindicated it with much ſolemnity, after having inquired into the matter, or pretended to do ſo. The other condition, which Philip had at firſt concealed, was diſcovered by the death of the emperor Albert of Auſtria; after which event he deſired Clement to aſſiſt him in placing his brother Charles of Valois on the Imperial throne. But his holineſs, apprehenſive of the danger which might accrue to himſelf from being ſurrounded with the powerful relations of Philip, urged the diet to proceed inſtantly to an election; recommending to them Henry of Luxemburg as a proper perſon to fill the Imperial throne. In this ſcheme he ſucceeded ſo well, that the election was over before Philip could arrive at Avignon; and the only conſolation the French monarch could obtain for his diſappointment was the poſſeſſion of the city of Lyons, which had hitherto maintained an independency under its archbiſhop; but was now perſuaded to ſubmit to the authority of Philip.

53 The Pope fixes his reſidence at Avignon.

54 Expedition of Philip againſt the earl of Flanders.

In the mean time Guy, earl of Flanders, being abandoned by his ally Edward king of England, was obliged to throw himſelf on the mercy of the French monarch, who had ſent his brother Charles of Valois, with a powerful army to invade his dominions. From the latter indeed he had obtained a promiſe, that if he could not, within a year, compoſe the differences ſubſiſting between him and Philip, he ſhould be at liberty to retire, and purſue what meaſures he pleaſed. But Philip, in order to gratify the reſentment which his queen entertained againſt the captive prince, detained him, with two of his ſons, in cloſe confinement, while he himſelf entering Flanders in triumph, was everywhere received as ſovereign of the country; and at his departure appointed John de Chatillon, a relation of the queen, to govern thoſe newly acquired territories.

The new governor took care to repair the fortifications which had been ſuffered to decay by reaſon of the aſſiduous application of the Flemings to trade; but being of a very haughty and tyrannical diſpoſition, and the poverty of the times not allowing his maſter to keep regular garriſons, an inſurrection quickly took place. This would have been effectually quelled by the diligence of the magiſtrates, had not Chatillon unluckily entered Bruges, and publicly diſplayed two hogſheads of ropes, which he threatened to employ in the execution of the inhabitants. On this they flew to arms, and maſſacred 1500 French; Chatillon himſelf being obliged to eſcape their fury by ſwimming over the town ditch. The inſurgents, now daily gathering ſtrength, ſoon amounted to an army of 60,000 men, who laid ſiege to Courtray. Here they were raſhly attacked in their trenches by the count d'Artois, who met with the reward of his temerity, being cut off with 20,000 of his troops. Philip determined on revenge; though the raiſing another army obliged him to debaſe the coin of the kingdom. Thus, however, he was enabled to enter Flanders with ſuch a force as would probably have ſubdued the whole country, had not Edward artfully communicated to the queen of France, as a ſecret, a feigned correſpondence between the French nobility and the court of Rome; by which falſe intelligence the king was induced to abandon the enterpriſe without performing any thing worthy of the armament he had fitted out. The war was continued for ſome time longer; but the attempts of Philip were conſtantly defeated by the ſteady valour of the Flemings; and the only recompenſe Philip obtained for all his trouble and expence was the city of Courtray.

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(53) The conqueſt of the country prevented by Edward III of England.

(54) Expulſion of the knights Templars.

The other remarkable tranſactions of this reign were the expulſion and confiſcation of the eſtates of the Templars, who at that time enjoyed immenſe poſſeſſions in France. The confiſcations took place without any form of trial, and upwards of 50 of them were put to death in a cruel manner. The grand maſter, with three of his principal officers, were burnt by a ſlow fire in the preſence of the king himſelf. The whole body of theſe unfortunate knights had been accuſed of the moſt groſs and abominable ſenſualities. The particulars were revealed, or pretended to be ſo, by two criminals who received their pardon for the diſcoveries they made; and theſe diſcoveries were confirmed by the confeſſion of the Templars themſelves. But this confeſſion was afterwards retracted, as being extorted from them by the fear of abſolute deſtruction; and thoſe who ſuffered, maintained their purity to the laſt: and on the whole, it was believed that Philip conſulted his avarice rather than his juſtice by this cruel execution. The latter part of his life was embittered by domeſtic misfortunes. His three daughters-in-law, Margaret daughter of the duke, and Jean and Blanch of the count, of Burgundy, who had married his three ſons, Louis, Philip, and Charles, were accuſed of infidelity to their huſbands. After a ſevere examination, Margaret and Blanch were condemned to perpetual impriſonment; in which ſituation Margaret was afterwards ſtrangled by order of her huſband Louis. Their paramours, Philip and Walter de Launay, two brothers, were flayed alive, and afterwards hung upon a gibbet, with an uſher of the chamber, who had been their confidant. The uneaſineſs of mind which Philip ſuffered on this account is ſuppoſed to have impaired his health, and he died of a conſumption in the year 1395, the 47th of his age, and 30th of his reign.

55 Reign of Louis the Boiſterous.

On the acceſſion of Louis, ſurnamed the *Boiſterous*, on account of his violent temper, he found his treaſury ſo much exhauſted, that he was obliged to delay for ſome time the ceremony of his coronation with his new queen Clemence, daughter of the king of Hungary. Finding the kingdom otherwiſe in a very diſtracted ſtate, he applied himſelf very diligently to appeaſe the diſcontents of his ſubjects, and conciliate their affection by

France. by every means in his power. In this he was aſſiſted by his uncle Charles of Valois, on whom he at length entirely devolved the government of the kingdom. This regent, however, behaved with ſuch cruelty as is ſuppoſed to have proved fatal to the king himſelf; for having put to death a nobleman named *Enguerrand de Poitier de Marigni*, who enjoyed the confidence of the late king, this cruelty was ſo much reſented, that his friends were thought to have adminiſtered poiſon to the king; who expired ſuddenly after drinking a glaſs of cold water, in the 26th year of his age, and ſecond of his reign. Immediately after his death, Charles prepared to diſpute the ſovereignty with the brothers of the late ſovereign. Philip count of Poictou, the eldeſt brother, was at that time at Rome aſſiſting in the election of a new pope; and it was not until a month after the death of his brother that he was able to put an end to the intrigues which took place on that occaſion: but on his arrival in France, the throne was aſſigned to him by the unanimous voice of the people. His proſpects, however, were for a ſhort time clouded by the queen dowager Clemence being delivered of a ſon, who has been enrolled among the kings of France under the name of *John I.* His death in three weeks ſecured the throne to Philip; who, on account of the tallneſs of his ſtature, was ſurnamed the *Long*. His conduct proved ſuperior to that of his prececeſſor, who had unſucceſsfully attempted to ſubdue the Flemings, and had even ſuffered himſelf to be duped by their count; but Philip, by his vigorous behaviour, ſo reduced them, that they compelled their ſovereign to conſent to a peace upon honourable terms. He ſummoned Edward II. of England to do homage for his poſſeſſions in France; but that monarch, finding himſelf involved in difficulties, which rendered the viſit inconvenient, ſent excuſes to Philip, which he was pleaſed to accept. As the French monarch had formerly taken the croſs during the lifetime of his father, he now propoſed to put his vow in execution; but was diſſuaded from this by the pope himſelf, at whoſe inſtance he ſent an army into Italy to put an end to the contending factions of the Guelphs and Gibbelines, who for ſo long time filled the country with blood and ſlaughter. The event proved unfortunate; and the diſgrace was rendered more mortifying by a contagious diſtemper, which ſwept off many thouſands of French ſubjects. This was ſuppoſed by the ſuperſtitious people of thoſe times to be occaſioned by the Jews, who had conſpired with the Saracens to poiſon the ſprings; and that the execution of the project was committed to ſome lepers who lived by themſelves in hoſpitals richly endowed. On this a perſecution was inſtantly commenced againſt theſe unfortunate men, and great numbers of them were burnt alive; while the Jews in general were abandoned to the rage of the populace, who inſulted their perſons, and plundered their houſes without remorſe.

56 Reign of Philip the Long.

57 Unfortunate expedition into Italy.

The remaining part of the reign of Philip was ſpent in attempting to regulate the internal concerns of his kingdom. A deſign had been formed by his predeceſſors of eſtabliſhing a certain ſtandard for the coin, weights, and meaſures, throughout France: and this was adopted by Philip; who, in order to carry it more effectually into execution, purchaſed from the counts of Valois, Clermont, and Bourbon, their right of coinage within their own dominions. But notwithſtanding all his endeavours for this purpoſe, he never could bring the ſcheme to bear: nor indeed could he in any degree conciliate the affection of his ſubjects. He died of a fever and dyſentery in the year 1322, the 28th year of his age, and 6th of his reign. France.

58 Reign of Charles the Fair.

By the death of Philip, the crown of France devolved on his brother Charles IV. who had obtained the ſurname of *Fair*. After ſettling ſome diſputes with the duke of Burgundy, his next ſtep was to diſſolve his marriage with Blanch, who ſtill continued in priſon, and to eſpouſe Mary the daughter of Henry emperor of Germany. This marriage was contracted with a view to the Imperial crown itſelf, which had been ſo long ſeparated from that of France; and in 1325 an opportunity offered for Charles to gratify his ambition. At that time the Imperial dignity was diſputed between Louis of Bavaria and Frederic of Auſtria; the latter of whom had been taken priſoner in a battle with Louis. But Pope John, who entertained an implacable hatred againſt Louis, fulminated the ſentence of excommunication againſt him, intruſting the execution of it to Leopold the brother of Ferdinand. The king of France was induced to embark in the ſame cauſe, by a promiſe of the ſpoils of Bavaria; while Frederic himſelf conſented to relinquiſh his pretenſions to the empire which he had ſo unſucceſsfully maintained. Louis, however, by inſtantly releaſing his priſoner, and diſmiſſing him in an honourable manner, engaged his friendſhip, and diſarmed his moſt formidable antagoniſt. But the pope was not to be diſappointed. A conſiderable ſum of money induced Leopold to perſevere in his hoſtilities, while it was determined that a new council of electors ſhould be held in order to transfer the Imperial crown to Charles. In purſuit of this viſionary ſcheme, the king of France ſet out for the frontiers of Germany with a ſplendid army; but ſoon found that there was no poſſibility of accompliſhing his wiſhes. Leopold alone, from motives of intereſt, remained his friend; the reſt ſhewed the greateſt indifference; and even his brother-in-law the king of Bohemia abſented himſelf from the diet; while in a ſhort time the death of the queen put an end to all connexions with that crown.

On the deceaſe of Mary, Charles eſpouſed Joanna daughter to the count of Evreux: and in order to avert the calamities to be feared from an infant ſucceſſion, he entered into an alliance with Robert king of Scotland; by which it was provided, that ſhould either of the ſovereigns die without an heir apparent, the ſtates of the kingdom ſhould fill the vacant throne, and the ſurvivor of the two kings ſhould with his whole force ſupport the legality of the nomination againſt any other competitor; though even this proved inſufficient to avert the danger which now threatened the kingdom, as ſhall be explained in the ſequel.

59 Candidates for the regency and kingdom on the death of Charles.

Charles died in the year 1328, in the 34th year of his age, leaving his queen pregnant; and as the ſucceſſion depended on the fruit of the queen's pregnancy, a regent in the mean time was neceſſary; and two candidates inſtantly appeared for this important poſt, urging at the ſame time their right to the crown as well as to the regency. Theſe were, Philip de Valois, couſin-german to the deceaſed king; the other, Edward III. king of England, who aſpired to the throne in

France. in right of his mother, and the nephew of Charles the Fair. His pretenſions, however, were eaſily ſet aſide, and Philip was confirmed in the regency: from which he ſoon after ſtepped into the throne, on the queen being delivered of a daughter; from which circumſtance he acquired the ſurname of *Fortunate*. But though the pretenſions of Edward, both to the regency and crown, were unanimouſly rejected by the people, it was ſtill impoſſible for Philip to think of the claims of ſuch a formidable rival without uneaſineſs. He therefore ſummoned the Engliſh monarch to do homage for his poſſeſſions in France; and, upon his not anſwering his ſummons, forfeited them, and ſeized his revenues. This at laſt induced Edward to croſs the ſea and pay his homage; which Philip conſented to receive in any form, upon condition of a proper explanation being afterwards given: but as this was ſtudiouſly delayed after the return of the king of England, the province of Guienne was again ſeized by the French monarch. Edward, unwilling to loſe his continental dominions, or involve himſelf in a war for the ſake of a mere ceremony, ſent over a formal deed, by which he acknowledged that he owed liege homage to France. Thus the flame was ſmothered for the preſent; and would perhaps have been entirely extinguiſhed, had it not been for the intrigues of Robert of Artois, brother-in-law to the king of France himſelf, who had been expelled his country, and had taken refuge in England. By him he was perſuaded to renew his pretenſions to the crown of France, which of neceſſity produced a war.

60 Diſputes with Edward III. of England.

For ſome time, indeed, neither party made any open declaration of hoſtility; but as both monarchs were poſſeſſed of great prudence and ſagacity, they ſoon penetrated each other's deſigns. Philip, under pretence of taking the croſs, began to make prodigious armaments, ſtrengthening himſelf at the ſame time by alliances on every ſide; while Edward, determining to renew his claim to the crown of France, projected the conqueſt of Scotland. This, however, he could not accompliſh; and in the mean time Philip, in order to favour the Scots, with whom he was in alliance, ſuffered his ſubjects to make irruptions into Guienne.

61 Edward's firſt expedition.

In 1337, the war broke out openly. Philip having detached a ſquadron of his fleet againſt the Infidels, employed the reſt, conſiſting chiefly of Genoeſe veſſels, againſt the Engliſh. As in this war it was of great importance which ſide was taken by the Flemings, theſe people were courted by both parties. Louis count of Flanders declared for Philip, but his ſubjects were more inclined to King Edward. James Arteville a brewer, the moſt able and artful man in the country, governed them at that time as much as if he had been their prince; and the advantages ariſing from the Engliſh commerce determining him in favour of Edward, that prince, at his requeſt, embarked for Sluys with a numerous army. Here he arrived in 1338; and on his firſt landing, it was reſolved that the German princes in alliance with him ſhould act againſt France. But for this a pretence was wanting. The vaſſals of the empire could not act by Edward's orders, or even as his allies, without directions from the emperor, and he was in league with France. This difficulty, however, was ſoon overcome: the French had made themſelves maſters of Cambray, and the emperor reſolved that it ſhould be retaken. With this view he created France. Edward *Vicar General of the Empire*; an empty title, but which ſeemed to give him a right of commanding the ſervices of the princes of Germany. The Flemings, who were vaſſals of France, likewiſe pretended ſcruples at invading the territories of their liege lord. To quiet theſe, Edward, by the advice of Arteville, aſſumed the title of *King of France*; and by virtue of this right challenged their aſſiſtance for dethroning Philip de Valois, the uſurper of his kingdom. This ſtep, which he feared would beget endleſs animoſities and jealouſies, he did not take without heſitation; and, according to Mr Hume, from this time we may date the commencement of that great animoſity which the Engliſh have always born to the French.

Edward's firſt attempt was upon the city of Cambray, to which he laid ſiege; but in a ſhort time he was prevailed upon by Robert d'Artois to raiſe the ſiege and march into Picardy. This country he entered with an army of near 50,000 men, compoſed moſtly of foreigners. Philip came within ſight of him with an army of near 100,000, compoſed chiefly of native ſubjects; and it was daily expected that a battle would enſue. But the Engliſh monarch was averſe to engage againſt ſo great a ſuperiority: and Philip thought it ſufficient if he eluded the attacks of his enemy, without running any unneceſſary hazard. The two armies faced each other for ſeveral days; mutual defiances were ſent; and Edward at laſt retired into Flanders, and diſperſed his army.

Such was the fruitleſs and almoſt ridiculous concluſion of Edward's firſt expedition, which had plunged him into the greateſt difficulties. He had contracted near 300,000l. of debt; he had anticipated all his revenue; he had pawned every thing of value which belonged either to himſelf or his queen; nay, he was obliged in ſome meaſure even to pawn himſelf to his creditors, by deſiring their permiſſion to go over to England in order to procure ſupply, and by promiſing on his word of honour to return in perſon if he did not remit their money. On his arrival in England, however, he procured a large ſupply, ſufficient to enable him to make all the neceſſary preparations for a new invaſion; and ſo certain were the Engliſh that France would now be conquered, that the parliament, before Edward's departure, proteſted that they owed him no obedience as king of France, but that the two kingdoms muſt remain for ever diſtinct and independent.

62 His ſecond expedition.

The king of England ſet out on his ſecond expedition with a fleet of 240 veſſels. Philip had prepared a fleet of 400 veſſels, manned with 40,000 men; which he ſtationed off Sluys, in order to intercept him in his paſſage. The two fleets met on the 13th of June 1340; but the Engliſh, either by the ſuperior abilities of Edward, or the greater dexterity of his ſeamen, gained the wind of the enemy, and had the ſun in their backs; and with theſe advantages began the action. The battle was fierce and bloody: The Engliſh archers, whoſe force and addreſs were now much celebrated, galled the French on their approach; and when the ſhips grappled together, the example of the king and the nobility who were with him ſo animated the ſeamen and ſoldiers, that they maintained everywhere a ſuperiority over the enemy. The Flemings obſerving the battle, hurried out of their ports, and brought

63 The French entirely defeated at ſea.

France. brought a reinforcement to the Engliſh; which coming unexpectedly, had a greater effect than in proportion to its power and numbers. Two hundred and thirty ſhips were taken: and 30,000 Frenchmen were killed, with two of their admirals: the loſs of the Engliſh was inconſiderable, compared to the greatneſs and importance of the victory. None of Philip's courtiers, it is ſaid, dared to inform him of the event; till his fool or jeſter gave him a hint, by which he diſcovered the loſs he had ſuſtained.

After this great victory, Edward landed his forces and laid ſiege to Tournay. Philip marched to its relief with a very numerous army: but acted with ſo much caution, that Edward found himſelf in a manner blocked up in his camp: and the counteſs dowager of Hainault, ſiſter to Philip, mother-in-law to Edward, and ſiſter-in-law to Robert d'Artois, coming out of a convent, to which ſhe had retired, interpoſed with ſo much ſpirit and addreſs, that ſhe engaged all parties to agree to a truce for a year, and might perhaps have brought about a peace if ſhe had ſurvived.

64 Edward invited into France a third time.

In 1341, however, Edward's ambition was once more excited by the invitation of the count de Mountfort, who had poſſeſſed himſelf of the province of Brittany, and applied to Edward to ſecond his claims. An offer of this kind entirely coincided with Edward's moſt ſanguine deſires. He was happy in the promiſed aſſiſtance of Mountfort, an active and valiant prince, cloſely united to him by intereſt, and thus opening to him an entrance into the heart of France. Theſe flattering proſpects, however, were for a while damped by the impriſonment of Mountfort; whoſe aims being diſcovered, he was beſieged in the city of Nantz and taken. But Jane of Flanders his wife ſoon made up for the loſs of her huſband. This lady courageouſly undertook to ſupport the falling fortunes of her family. She aſſembled the inhabitants of Rennes, where ſhe then reſided; and carrying her infant ſon in her arms, deplored her misfortunes, and attempted to inſpire the citizens with an affection for her cauſe. The inhabitants of Nantz inſtantly eſpouſed her intereſts, and all the other fortreſſes of Brittany embraced the ſame reſolution. The king of England was appriſed of her efforts; and was entreated to ſend her ſuccours with all poſſible expedition to the town of Hennebone, in which place ſhe reſolved to ſuſtain the attacks of the enemy. Charles de Blois, Philip's general, anxious to make himſelf maſter of ſo important a fortreſs as Hennebone, and ſtill more to take the counteſs a priſoner, ſat down before the place with a large army, and conducted the ſiege with indefatigable induſtry. The defence was no leſs vigorous: ſeveral ſallies were made by the garriſon, in which the counteſs herſelf was ſtill the moſt active, and led on the aſſault. Obſerving one day that their whole army had quitted the camp to join in a general ſtorm, ſhe ſallied out by a poſtern at the head of 300 horſe, ſet fire to the enemies tents and baggage, put their ſutlers and ſervants to the ſword, and occaſioned ſuch an alarm, that the French deſiſted from the aſſault, in order to cut off her communication with the town. Thus intercepted, ſhe retired to Auray, where ſhe continued five or ſix days; then returning at the head of 500 horſe, ſhe fought her way through one quarter of the French camp, and returned to her faithful citizens in triumph. But the beſiegers had at length made ſeveral breaches in the walls; and it was France. apprehended that a general aſſault, which was hourly expected, would be fatal. A capitulation was therefore propoſed, and a conference was already begun, when the counteſs, who had mounted on a high tower, and was looking towards the ſea with great impatience, deſcried ſome ſhips at a diſtance. She immediately exclaimed that ſuccours were arrived, and forbade any further capitulation. She was not diſappointed in her wiſhes; the fleet ſhe diſcerned carried a body of Engliſh gentlemen, with 6000 archers, whom Edward had prepared for the relief of Hennebone, but who had been long detained by contrary winds. They entered the harbour under the conduct of Sir Walter Manny, one of the moſt valiant commanders of his time. This relief ſerved to keep up the declining ſpirits of the Bretons until the time appointed by the late truce with Edward was expired, on which he was at liberty to renew the war in greater form.

The ſuccours under Sir Walter Manny were quickly followed by a more conſiderable reinforcement commanded by Robert of Artois, who made himſelf maſter of the city of Vannes ſoon after his arrival: but the French ſoon recovered the city, and Robert was compelled to relinquiſh his prize after receiving a mortal wound. Edward himſelf, eager to revenge the death of his ally, ſoon landed at Morbian near Vannes with an army of 12,000 men. With this ſmall number he undertook at once the ſiege of Vannes, Nantz, and Rennes: but by dividing his forces, he failed in every enterpriſe, and gave an opportunity to John duke of Normandy, the king of France's eldeſt ſon, to inveſt him in his camp. In this ſituation his proviſions ſoon began to fail; and Edward, notwithſtanding all his valour, would have been obliged to ſurrender, had he not, by a train of artful negociations, induced Philip to relinquiſh the advantage he had obtained, and conſent to a truce of three years. This was accompliſhed by the mediation of the court of Rome; and the French monarch was ſoon made ſenſible of the partiality of that court, and the imprudence of the ſtep he himſelf had taken. Edward ſoon found a pretence to renew the war, from the execution of ſome nobles of Brittany, who, he ſaid, were partiſans of Mountfort, and choſe to look upon their puniſhment as an infraction of the treaty.

Philip now endeavoured to ſecure himſelf againſt the power of his rival by alliances, and by purchaſing the city of Montpelier from the king of Majorca: but in the mean time, the Engliſh, under the command of the earl of Derby, had invaded Guienne, twice defeated the French army commanded by the count de Liſle, and made themſelves maſters of a great number of towns. Philip, by reaſon of the exhauſted ſtate of his treaſury, was for ſome time incapable of making any oppoſition. To recruit his finances, he was obliged to lay a duty on ſalt; which gave ſuch offence to his ſubjects as had almoſt excited a rebellion. When theſe diſcontents were aſſuaged, however, he ſoon raiſed an army of 100,000 men, whoſe courage was further raiſed by the preſence of the dukes of Normandy and Burgundy. The Engliſh general was therefore compelled to ſtand upon the defenſive. One fortreſs after another was ſurrendered to the French; till at length nothing appeared but the total extinction of the power

France. of England upon the continent. In this ſituation, Edward reſolved to bring relief in perſon to his diſtreſſed ſubjects and allies; and accordingly embarked in 1346 at Southampton, on board a fleet of near 1000 ſail, of all dimenſions. He carried with him, beſides all the chief nobility of England, his eldeſt ſon the prince of Wales (afterwards ſurnamed the *Black Prince*), a youth of about 15 years old, and already remarkable both for underſtanding and valour above his age. His army conſiſted of 4000 men at arms, 10,000 archers, 10,000 Welſh infantry, and 6000 Iriſh; all which he landed ſafely at La Hogue, a port in Normandy, which country he determined to make the ſeat of the war.

65 He lands with an army in Normandy.

The intelligence of Edward's landing, and the devaſtation cauſed by his troops, who diſperſed themſelves over the whole face of the country, ſoon ſpread univerſal conſternation through the French court. The rich city of Caen was taken and plundered by the Engliſh without mercy; the villages and towns, even up to Paris, ſhared the ſame fate; and the French had no other reſource but by breaking down their bridges, to attempt putting a ſtop to the invader's career. In the mean time, Philip was not idle in making preparations to repreſs the enemy. He had ſtationed one of his generals, Godemar de Faye, with an army on the oppoſite ſide of the river Somme, over which Edward was to paſs; while he himſelf, at the head of 120,000 fighting men, advanced to give the Engliſh battle. Edward, thus unexpectedly expoſed to the danger of being encloſed and ſtarved in an enemy's country, publiſhed a reward to any that ſhould bring him intelligence of a paſſage over the river Somme. This was diſcovered by a peaſant of the country, named Gobin Agace: and Edward had juſt time to get his whole army over the river, when Philip appeared in his rear. Of the battle that enſued, in which the French were overthrown with great ſlaughter, an account is given under the article CRESSY.

66 Calais taken.

Edward next laid ſiege to Calais, which was then defended by John de Vienne, an experienced commander, and ſupplied with every thing neceſſary for defence. It was at length taken, after a twelvemonth's ſiege, the defendants having been reduced to the laſt extremity by famine and fatigue: for the conſequences of which, ſee the article CALAIS.

From the very beginning of this unfortunate war, Philip had invariably ſhowed himſelf deſirous of peace, and the victory of Creſſy rendered him ſtill more ſo. Edward alſo notwithſtanding his ſucceſſes, was unable to ſupport the expences of the war any longer. The mediation of the court of Rome was therefore readily accepted, and a truce for three years concluded. At the ſame time, Philip met with ſome recompenſe for the loſſes he had ſuſtained, by the acquiſition of Dauphiny, which has ever ſince given the title of *Dauphin* to the eldeſt ſon of the king of France. It was obtained by the reſignation of Hubert prince of Dauphiny; who, being diſappointed in his hopes of marrying Joan, daughter of the duke of Bourbon, gave up his territories to Charles the grandſon of Philip, who had married that lady; himſelf retiring into a convent. Soon after this event, the king himſelf, who had been ſome time a widower, was married to Blanch, the daughter of Philip count of Evreux, and Jane queen of Navarre; and his ſon John to the counteſs of Boulogne. But the happineſs occaſioned by theſe marriages was ſoon interrupted by the death of the king; who expired in the year 1350, the 57th of his age, and 23d of his reign.

France. 67 Death of King Philip.

On the death of Philip his eldeſt ſon John took poſſeſſion of the kingdom; but ſcarcely was he ſeated on the throne, when he diſguſted his nobility by an unſeaſonable act of ſeverity. Robert de Brienne, count of Eu and Guiſnes, had been taken priſoner by the king of England at Caen; and under pretence of negotiating his ranſom, had paſſed ſeveral times between France and England; but being accuſed of a treaſonable correſpondence with Edward, he was by order of his ſovereign ſuddenly arreſted, condemned, and beheaded, without any form of trial. At his death, it is ſaid that he confeſſed his treaſonable practices; but that has not been authenticated by any hiſtorian of credit. Having been conſtable of France, the ſword, the badge of his office, was delivered to Charles de la Carda: but his fate was equally unfortunate with that of his predeceſſor, being ſoon after aſſaſſinated by Charles king of Navarre, ſurnamed *The wicked*. This prince, celebrated for his perſonal qualifications, but deteſted for his crimes, was the ſon-in-law of John himſelf. He had demanded the duchy of Angouleme of the king: but as the latter had thought proper to beſtow it upon Carda, he had taken the effectual method of revenging himſelf, by aſſaſſinating his rival. John did not fail to ſhow a proper reſentment; but ſuch was the weakneſs of his government, that the king of Navarre ſet him at defiance, and would not even condeſcend to the ceremony of aſking pardon until John had ſent him his ſecond ſon as an hoſtage for his perſonal ſecurity. To theſe offences the king of Navarre added another ſtill more atrocious, viz. that of aſpiring to the crown of France itſelf; to which he pretended a right derived from his mother, being grandſon by the female ſide to Louis the Boiſterous. But his more immediate demands were the countries of Champagne and Brie. To obviate all difficulties on this head, however, John beſtowed the duchy of Normandy on his eldeſt ſon Charles; and commanded him to ſeize the eſtates of the king of Navarre. On this the latter ſoon made his appearance at Paris; but John found himſelf obliged to appeaſe his murmurs at the expence of no leſs than 100,000 crowns.

68 Infamous conduct of the king of Navarre.

All this time the truce with England had been very ill obſerved on both ſides; the French had poſſeſſed themſelves of the port of St Jean d'Angeli; and the Engliſh had ſurpriſed the town of Guiſnes. The rival houſes of Mountfort and Blois ſtill continued their animoſities; while Edward continued to threaten war. The king of Navarre went on with his intrigues; and even the dauphin was drawn into a confederacy againſt his father. John, however, being informed of their machinations, found means to defeat them effectually. The dauphin was reclaimed by pointing out to him the impropriety of his conduct, and the diſadvantage which muſt unavoidably accrue to himſelf from the connexions which he had formed. The king of Navarre was invited, with his principal adherents, to an entertainment, where they were unexpectedly arreſted: the former being ſent priſoner to Chateau Gaillard, and ſeveral of the moſt obnoxious of the latter put to death. The reſt of the conſpirators, inſtead

69 He is taken and confined.

France. instead of being dismayed by this check, immediately showed themselves in open rebellion; and finding themselves unable, without farther assistance, to gain their point, they without delay invited over Edward from England.

70 France again invaded by Edward. That warlike and enterprising monarch had never lost sight of the object he had originally embraced; and on the expiration of the truce had sent his son, the prince of Wales, from the colour of his armour surnamed the *Black Prince*, with a fleet towards the coast of France. Young Edward had with this fleet entered the mouth of the river Garonne, burnt the towns and villages of Languedoc, and retired with the plunder into the country of Guienne. Edward himself, who had likewise passed over to the continent, wasted the country as far as St Omer; but the French king, notwithstanding all these provocations, determined to avoid a battle, and therefore prohibited his general, the constable of Bourbon, from coming to an engagement, though his army was much superior to that of the prince of Wales. With the flower of his troops, however, he pursued Edward from St Omer to Hesdin, where he defied him to a pitched battle; but the latter, without minding his bravadoes, continued his march to Calais, from whence he embarked for England. After his departure, John called an assembly of the states at Paris, where he explained the distressed situation of his finances, and showed so fully the necessity of assisting him in the defence of the kingdom, that they consented to maintain an army of 30,000 men during the war. To supply the other exigencies of government, they revived the duty on salt, and added a variety of other imposts; but at the same time appointed a committee of their own number to take care that the money was solely appropriated to the public service.

The satisfaction which John received from these grants, and the suppression of some disturbances which happened about this time, was soon overcast by the news that the prince of Wales had marched with an army of 12,000 men from Bourdeaux; and, after ravaging the Agenois, Quercy, and the Limousin, had entered the province of Berry. The young warrior had penetrated into the heart of France with this trifling body of forces, in hopes of joining the duke of Lancaster in Guienne. But he soon found that his scheme was impracticable: the country before him was too well guarded to permit his advancing further; and all the bridges behind were broken down, which effectually barred a retreat. In this embarrassing situation, his perplexity was increased, by being informed, that the king of France was actually marching at the head of 60,000 men to intercept him. He at first thought of retreating: but soon finding it impossible, he determined calmly to wait the approach of the enemy; and, notwithstanding the disparity of forces, to commit all to the hazard of a battle.

71 Battle of Poictiers. It was at a place called *Maupertuis*, near Poictiers, that both armies came in sight of each other. The French king might very easily have starved the English into any terms he thought proper to impose; but such was the impatient valour of the French nobility, and such their certainty of success, that it might have been equally fatal to attempt repressing their ardour to engage. In the mean time, while both armies were drawn out, and expecting the signal to begin, they were France. stopped by the appearance of the cardinal of Perigord, who attempted to be a mediator between them. However, John, who made himself sure of victory, would listen to no other terms than the restitution of Calais; with which the Black Prince refusing to comply, the onset was deferred till the next morning, for which both sides waited in anxious suspense.

During this interval, the young prince strengthened his post by new intrenchments; and placed 300 men in ambush, with as many archers, who were commanded to attack the enemy in flank during the heat of the engagement. Having taken these precautions, he ranged his army in three divisions; the van was commanded by the earl of Warwick, the rear by the earls of Salisbury and Suffolk, and the main body by himself. In like manner, the king of France arranged his forces in three divisions; the first commanded by the duke of Orleans; the second by the dauphin, attended by his younger brothers; while he himself led up the main body, seconded by his youngest and favourite son, then about 14 years of age. As the English were to be attacked only by marching up a long narrow lane, the French suffered greatly from their archers, who were posted on each side behind the hedges. Nor were they in a better situation upon emerging from this danger, being met by the Black Prince himself, at the head of a chosen body of troops, who made a furious onset upon their forces, already in great disorder. A dreadful overthrow ensued: those who were 72 French defeated. as yet in the lane recoiled upon their own forces; while the English troops who had been placed in ambush, took that opportunity to increase the confusion, and confirm the victory. The dauphin and the duke of Orleans were among the first that fled. The king of France himself made the utmost efforts to retrieve by his valour what his rashness had forfeited; but his single courage was unable to stop that consternation which had now become general through his army; and his cavalry soon flying, he found himself exposed to the enemy's fury. At length, spent with fatigue and despairing of success, he thought of yielding himself a prisoner; and frequently cried out, that he was ready to deliver himself to his cousin the prince of Wales. The 73 King John taken prisoner. honour of taking him, however, was reserved for a much more ignoble hand; he was seized by Dennis de Morbec, a knight of Arras, who had been obliged to fly his country for murder.

In April following, the prince conducted his royal prisoner through London, attended by an infinite concourse of people of all ranks and stations. His modesty upon this occasion was very remarkable: the king of France was clad in royal apparel, and mounted on a white steed distinguished by its size and beauty; while the prince himself rode by his side upon a mean little horse, and in very plain attire.

This dreadful defeat, which happened in the year 74 Miserable situation of France. 1356, almost entirely ruined the French affairs; and the miseries which ensued from this cause were greatly augmented by internal commotions. The dauphin, who had now assumed the government, was altogether unable to govern a turbulent and seditious people at such a crisis. An assembly of the states, which he called, took the opportunity to limit the power of the prince, impeach the former ministers, and demand the

France. liberty of the king of Navarre; the treaſurer of the crown was murdered by one Marcel, a partizan of that worthleſs prince who had filled the city of Paris with confuſion by his intrigues. The aſſaſſin whom Marcel employed was dragged, by order of the dauphin, from an altar where he had taken refuge, and inſtantly put to death. The biſhop of Paris reſented the indignity done to the church; and Marcel avenged the fate of his adherent, by murdering both the mareſchals who had ſeized him in the preſence of the dauphin; and ſo near him, that his clothes were ſtained with their blood. The prince indignantly aſked him, if he was to be involved in the ſame deſtruction? when Marcel affected to provide for his ſafety by putting upon him a blue hood, the badge of the adherents of Navarre. The public diſorders were now alſo augmented by the eſcape of the king of Navarre from confinement; and though the dauphin was even aſſured that he had adminiſtered a doſe of poiſon to him, he was obliged ſtill to pay him ſome appearance of regard. A ſcheme was even formed by the chiefs of the ſedition to change the government, to veſt all the power in the commons, and leave the king no more than an empty title; but though this was favourably received by the city of Paris, it was entirely rejected by the other cities of the kingdom. The dauphin was likewiſe recognized as regent by the ſtates general, and the inhabitants of Picardy and Champagne took up arms in his cauſe.

75 The king of Navarre eſcapes from priſon.

76 Inſurrections and tumults of the peaſants.

In this diſaſtrous ſtate of affairs, the miſeries of the people were heightened by a new and unexpected evil. The peaſants, who had been all along oppreſſed by the nobles, were now treated in ſuch a manner, that they roſe in great numbers to revenge themſelves; the caſtles of the nobility were raſed to the ground, their wives and daughters raviſhed, and themſelves put to the moſt cruel torments. At laſt they were obliged to arm in their own defence. The duke of Orleans cut off 10,000 of them in the neighbourhood of Paris; 12,000 were maſſacred by the king of Navarre; 9000, who had laid ſiege to the town of Meaux, where the dauphineſs and three other ladies of the firſt rank reſided, were routed and purſued with dreadful ſlaughter by an officer in the ſervice of Edward. Amidſt theſe confuſions, Marcel, the ſeditious leader already mentioned, periſhed in a tumult of his own raiſing; and the moſt virtuous and prudent people of the nation ſupported the pretenſions of the dauphin. His moſt dangerous enemy was the king of Navarre, who had allured to his ſtandard numbers of thoſe Norman and Engliſh adventurers who had followed Edward into France, and there been left to ſeek their fortunes; where they aſſociated themſelves under the name of the *Companions*. By ſuch a formidable competitor the dauphin was reduced almoſt to the laſt extremity, when his hopes were revived by an unexpected propoſal from his rival, of peace upon equitable and moderate terms. Hiſtorians in general have aſcribed this to the natural levity of the king of Navarre; but ſome have been of opinion that he acted from prudential motives, and that he juſtly ſuppoſed it would be more eaſy to deal with the dauphin who was his own kinſman, and humbled by ſo many misfortunes, than with a haughty and imperious conqueror like Edward.

77 Peace between the dauphin and king of Navarre.

On the expiration of the truce in 1359, Edward again ſet ſail for France, and anchored before Calais with a fleet of 1100 ſail, aſſumed the title of *King of France*, and augmented his army to 100,000 men. The dauphin, finding himſelf unable to withſtand ſo great a power, was obliged to act on the defenſive; chooſing the city of Paris for his ſtation, and allowing the Engliſh to ravage all the open country. Thus they were allowed to penetrate through Picardy into Champagne; but the city of Rheims, where Edward deſigned to have been crowned king of France, baffled their utmoſt efforts. From Champagne, therefore, which was already laid waſte, the Engliſh monarch marched into Burgundy; pillaging Tonnere, Gaillon, and Avalon. Burgundy was ſaved by the payment of 100,000 merks, and a like ſum was paid for Nivernois. At laſt, after a long and deſtructive march, Edward arrived at the gates of Paris; but the prudence of the dauphin and citizens of that metropolis had rendered it impregnable to the attacks of famine as well as the aſſaults of an army. Thus the war went on till the year 1360, when the king of England was inclined to peace, as is ſaid, by a dreadful tempeſt, to which his army was expoſed while encamped in the fields round Chartres. His conduct, however, may more reaſonably be derived from other motives. Notwithſtanding all the victories he had gained, the French nation ſhowed not the leaſt favour to his claim of ſucceſſion; the king of Navarre was a dangerous rival, and the caution of the dauphin in avoiding an engagement deprived him of the advantages he might expect from his valour and military ſkill. Thus conferences for a peace were opened at Bretigny in the Chartraine; and it was at laſt concluded on the following conditions, viz. That King John ſhould pay for his ranſom, at different periods, three millions of crowns of gold (about a million and a half of our money): Edward ſhould for ever renounce all claim to the kingdom of France; and ſhould remain poſſeſſed of the territories of Poicton, Xaintonge, l'Agenois, Perigord, the Limouſin, Quercy, Rouvergne, l'Angoumois, and other diſtricts in that quarter, together with Calais, Guiſnes, Montreuil, and the county of Ponthieu on the other ſide of France. Some other ſtipulations were made in favour of the allies of England, as a ſecurity for the execution of theſe conditions.

France. 78 A new invaſion of France by Edward.

79 He concludes a peace.

Upon John's return to his dominions, he found himſelf very ill able to ratify thoſe terms of peace that had been juſt concluded. He was without finances, at the head of an exhauſted ſtate; his ſoldiers without diſcipline, and his peaſants without ſubordination. Theſe had riſen in great numbers; and one of the chiefs of the banditti aſſumed the title of *The Friend of God and the terror of Man*. A citizen of Sens, named *John Gouge*, alſo got himſelf, by means of his robberies, to be acknowledged king; and he ſoon cauſed as many calamities by his devaſtations, as the real king had brought on by his misfortunes. Such was the ſtate of that wretched kingdom upon the return of its captive monarch: and yet ſuch was his abſurdity, that he immediately prepared for a croiſade into the Holy Land, before he was well replaced on the throne. Had his exhauſted ſubjects been able to equip him for this chimerical project, it is probable he would have gone through with it; but their miſeries were ſuch, that they were even too poor to pay his ranſom. This was a breach of treaty that John would not ſubmit to; and

80 John unable to pay his ranſom, returns to England.

France. and he was heard to expreſs himſelf in a very noble manner upon the occaſion: "Though (ſays he) good faith ſhould be baniſhed from the reſt of the earth, yet ſhe ought ſtill to retain her habitation in the breaſt of kings." In conſequence of this declaration, he actually returned to England once more; and yielded himſelf a priſoner, ſince he could not be honourably free. It is ſaid by ſome, that his paſſion for the counteſs of Saliſbury was the real cauſe of his journey: but we want at this time the foundations for ſuch an injurious report. He was lodged in the Savoy, the palace where he had reſided during his captivity; and ſoon after he cloſed a long and unfortunate reign, by his death, which happened in the year 1384, about the 56th year of his age.

81 Dies, and is ſucceeded by Charles the Wiſe.

Charles, ſurnamed *the Wiſe*, ſucceeded his father on the throne of France; and this monarch, merely by the force of a finely conducted policy, and even though ſuffering ſome defeats, reſtored his country once more to tranquillity and power. He quelled and diſſipated a ſet of banditti, who had aſſociated themſelves under the name of *Companions*, and who had long been a terror to the peaceable inhabitants. He had them enrolled into a body, and led them into the kingdom of Caſtile againſt Peter, ſurnamed *the Cruel*, whom his ſubjects had dethroned, and who, by means of an alliance with the Engliſh, endeavoured to get himſelf re-inſtated upon the throne. In conſequence of theſe alliances, the Engliſh and French again came to an engagement; their armies on the one ſide commanded by the Black Prince; on the other, by Henry of Traſtamarre, and Bertrand du Gueſclin, one of the moſt conſummate generals and accompliſhed characters of the age in which he lived. However, the uſual good fortune of the Engliſh prince prevailed; the French loſt above 20,000 men, while only four knights and 40 private men on the ſide of the Engliſh were ſlain.

82 Bad ſucceſs of the Engliſh.

Nevertheleſs, theſe victories were attended with very few good effects. The Engliſh, by their frequent levies, had been quite exhauſted, and were unable to continue an army in the field. Charles, on the other hand, cautiouſly forebore coming to any deciſive engagement; but was contented to let his enemies waſte their ſtrength in attempts to plunder a fortified country. When they were retired, he then was ſure to ſally forth, and poſſeſs himſelf of ſuch places as they were not ſtrong enough to defend. He firſt fell upon Ponthieu; the citizens of Abbeville opened their gates to him; thoſe of St Valois, Ruc, and Crotoy, imitated the example; and the whole country was in a little time, reduced to total ſubmiſſion. The ſouthern provinces were, in the ſame manner, invaded by his generals with equal ſucceſs; while the Black Prince, deſtitute of ſupplies from England, and waſted by a cruel and conſumptive diſorder, was obliged to return to his native country, leaving his affairs in the ſouth of France in a deſperate condition.

In this exigence, the reſentment of the king of England was excited to the utmoſt pitch; and he ſeemed reſolved to take ſignal vengeance on his enemies of the continent. But the fortunate occaſion was now elapſed; and all his ſucceeding deſigns were marked with ill ſucceſs. The earl of Pembroke and his whole army were intercepted at ſea, and taken priſoners by Henry king of Caſtile. Sir Robert Knolles, one of his generals on the continent, at the head of 30,000 men, was defeated by Bertrand du Gueſclin; while the duke of Lancaſter, at the head of 25,000 men, had the mortification of ſeeing his troops diminiſhed one half by flying parties, without ever coming to a battle. France.

At laſt, the Engliſh affairs were totally ruined by the death of the Black Prince and King Edward. On receiving this news, the armies of Charles attacked the Engliſh on all ſides. One, under the command of the duke of Burgundy, entered Artois; another entered Auvergne, under the command of the duke of Berry; that which acted in Guienne was commanded by the duke of Anjou; and the forces in Bretagne were under the conſtable Gueſclin: the king himſelf had a powerful body of troops, that he might be able to repair any accident which ſhould happen through the chance of war. The conſtable joined the duke of Burgundy, who found it difficult to oppoſe Sir Thomas Felton and the ſeneſchal of Bourdeaux. Soon after his arrival, the conſtable attacked and defeated them, making both the commanders priſoners of war. This victory was ſo well purſued, that, at the cloſe of the campaign 1377, Bayonne and Bourdeaux, with the diſtricts about them, and the fortreſs of Calais with its dependencies, were all the places left to England on the continent.

83 Death of Charles;

Thus Charles eſtabliſhed once more the houſe of Valois on the throne of France, but did not long live to enjoy his good fortune. He died in the year 1379, at the age of 44, of the conſequences of poiſon formerly given him by the king of Navarre, as has already been mentioned. The immediate operation of this poiſon had been ſuſpended by the ſkill of a phyſician ſent by the emperor Charles IV. He opened an iſſue in his arm, the running of which preſerved his life; but the phyſician declared, that whenever it ſhould dry up, the conſequence would be fatal. Not long before his death, Charles had commenced a proceſs againſt the king of Navarre for this crime. Several of the aſſociates of the latter ſuffered on this occaſion, and the king himſelf was deprived of his poſſeſſions in Normandy, as well as his lordſhip of Montpelier, which had been given him in lieu of the counties of Champagne and Brie, and the duchy of Burgundy which he had claimed. He did not long ſurvive the death of the French monarch whom he deſtroyed. His death was ſingular and very terrible; for having been afflicted with the leproſy, he had been obliged to make uſe of ſome bandages dipped in ſulphur, and afterwards ſteeped in brandy. Theſe took fire by the careleſſneſs of a page, and the unfortunate prince was burnt to death.

84 and of the king of Navarre.

85 Reign of Charles VI.

Charles V. was ſucceeded by his ſon Charles VI. ſurnamed the *Well-beloved*, who, at the time of his acceſſion to the throne, was only 12 years of age. The duke of Anjou, eldeſt brother to the late king, had been appointed guardian during the minority of the prince; but he being totally unfit for the office, and diſtinguiſhed only for his rapacity and ambition, readily reſigned his charge to the dukes of Burgundy and Bourbon, the former uncle to the king by his father's ſide, the latter by his mother's. None of theſe tutors, however, proved faithful to the truſt repoſed in them. The duke of Anjou ſeized the plate and treaſures of the

late

France. late king, in order to ſupport his ambitious enterprifes. At that time Joan, infamous for her profligacy, reigned in Naples. She had appointed one Charles Durazzo, who was her relation, to ſucceed her in the throne; but the inhuman wretch murdered his benefactreſs, who with her laſt breath revoked her grant of the kingdom to him, and beſtowed it upon the duke of Anjou. His influence at the French court enabled him to waſte the treaſures of the kingdom in ſupport of his pretenſions; though he proved ultimately unſucceſsful, his forces being conſtantly defeated, and his deſigns fruſtrated by the ſuperior ſkill of his adverſary. The duke of Burgundy, inſtead of inſtructing his pupil in the ways of virtue, indulged him in every kind of vicious pleaſure, hoping thereby to gain his favour afterwards. The citizens of Paris, oppreſſed by taxes, broke out into tumults, and were quelled with difficulty; while the mal-adminiſtration of
86 Philip the duke of Burgundy ſoon involved the nation
Flanders in hoſtilities with the Flemings. Philip invaded their
invaded. country at the head of an army of 80,000 men, along with whom was the young king, accompanied by the principal nobility of France. The firſt operations of war were favourable to the Flemings; but they were at length totally defeated on the banks of the river Lis, where their leader, with 25,000 of his followers, periſhed. This victory was followed by the ſubmiſſion of the whole country; but the ſatisfaction of the king at this event was diſturbed by new ſeditions and revolts in the city of Paris, and other great towns of the kingdom. His return, however, at the head of a victorious army, ſoon reduced them to their duty, and ſeveral of the revolted cities were ſeverely puniſhed; at the ſame time that the death of the duke of Anjou having freed him from the immediate dependence on his tutors, he aſſumed the reins of government into his own hands in the year 1384.

The genius which Charles began to diſplay in his early years, raiſed the hopes of the nation; but theſe were ſoon overcaſt, and greater misfortunes than ever were now about to enſue. The young king whoſe marriage began to be a ſubject of attention to the council, refuſed to comply with the forms in uſe among his predeceſſors, and inſiſted upon ſeeing the
87 perſon deſigned for his conſort. An interview was
Marries accordingly contrived betwixt him and Iſabella daugh-
Iſabella ter to the duke of Bavaria; where he fell in love with
daughter to that princeſs, and afterwards married her. His admi-
the duke of niſtration was for ſome time prudent and vigorous.
Bavaria. He conciliated the affections of his people by reſtoring their privileges, puniſhing their oppreſſors, and relieving them from the taxes which had been impoſed in his minority. He reduced the Flemings to ſubmit to the authority of his uncle the duke of Burgundy; detached 15,000 archers and 1500 men at arms to aſſiſt the Scots in their incurſions into England; and in 1385 fitted out a prodigious armament againſt England. A vaſt fleet was aſſembled in the harbour of Sluys, and a very numerous army in the neighbourhood. According to ſome writers, the armament conſiſted of 1200 ſhips, 20,000 foot differently armed, 20,000 cavalry, and 20,000 croſs-bow men. There was beſides a vaſt wooden edifice or floating town, which was contrived for the protection of the ſoldiers when landed: but all theſe preparations were at laſt brought to nothing through the obſtinacy of the duke of Berry; who, having been originally againſt this meaſure, carried on his part of the armament ſo ſlowly, that he did not arrive at Sluys till the middle of September, when the ſeaſon was ſo far advanced, that no invaſion was practicable. A ſtorm that happened ſoon after, drove the greateſt part of the fleet on ſhore, and beat the wooden edifice all to pieces; the remains of which the king beſtowed on the duke of Burgundy, to whom he gave alſo the port of Sluys, which was then very commodious, and of the utmoſt importance. France.

The deſtruction of the French fleet was only a prelude to calamities of a more extraordinary nature. The Sieur de Craon, a profligate nobleman, had been intruſted by the court of France with a conſiderable ſum of money for the ſupport of the duke of Anjou, at the time he was reduced to diſtreſs by his Italian expedition. This money he had diſſipated at Venice; but, by the credit of the duke of Orleans, the king's brother, he had obtained his pardon, and returned to court. Here he attempted to gratify his private reſentment by the aſſaſſination of Oliver Cliſſon the conſtable, whom he ſuſpected of having promoted his diſgrace. This veteran hero was attacked, on his return from the hotel de St Pol, by a band of 20 ruffians, againſt whom he defended himſelf with wonderful intrepidity, when at laſt he fell, after receiving more than 50 wounds. Happily, however, he recovered notwithſtanding his being mangled in this manner; while the aſſaſſin, to ſcreen himſelf from vengeance, fled for protection to the duke of Brittany. The king demanded the aſſaſſin to be given up to him in chains; but the duke anſwered, that he knew nothing of him: to which the king giving no credit, marched with all his forces into his territories. When the army arrived
88 at Mans, the king was ſeized with a ſlow fever; but
Is ſeized could not be prevailed upon to reſt or take phyſic. On
with luna- the 5th of Auguſt 1391, having marched all day in
tic fits. the heat of the ſun, a miſerable, ragged, wild-looking fellow darted from behind a tree, and laying hold of the bridle of his horſe, cried out "Stop! where are you going, king? You are betrayed:" and immediately withdrew again into the wood. The king paſſed on not a little diſturbed; and ſoon after one of the pages, who rode behind and carried his lance, overcome with heat, fell aſleep, and let it fall upon the helmet which was carried by the other. The king hearing the noiſe, looked about; and perceiving the page lifting the lance, killed him immediately: then riding furiouſly with his ſword drawn, he ſtruck on every ſide of him, and at every perſon, till he broke his ſword: upon which one of his gentlemen leaped up behind him and held his arm. He fell ſoon after, and lay as if he had been dead; ſo that being taken up and bound in a waggon, he was carried back to Mans, where he lay two days in a lethargy, after which he came a little to himſelf, and expreſſed great concern at the blood he had ſhed in his delirium. The people who had expreſſed the greateſt concern for his diſtemper, were equally rejoiced at the news of his recovery; but unfortunately it was ſoon diſcovered, that he no longer poſſeſſed that ſtrength of judgment and underſtanding for which he had formerly been remarkable. Hence a regency became indiſpenſably neceſſary; and

France. and the competition for it brought to light the characters of the queen and duke of Orleans, which had not hitherto been diſplayed to public view. The former of theſe was a moſt beautiful and accompliſhed princeſs; but vindictive, violent, and intriguing: inſenſible to natural affection, but eaſily acceſſible to flattery, and ready to yield to every impulſe of lawleſs paſſion. The duke of Orleans was equally remarkable for his perſonal accompliſhments, and had married Valentina daughter of the duke of Milan; but his engagements with that princeſs did not prevent him from engaging in a number of licentious amours, and among the reſt, as was ſuppoſed, with his ſiſter-in-law Iſabella. During the king's illneſs he openly aſpired at the regency; but his pretenſions were overruled by the ſtates, the adminiſtration of affairs being for the preſent conferred on the duke of Burgundy. In a few months indeed the health and underſtanding of the king ſeemed to be ſufficiently reſtored: but in the year 1393 it was again diſturbed by an accident no leſs extraordinary than the former had been. An entertainment had been given in honour of the marriage of one of the queen's attendant's. At this ſix maſques entered the apartment, diſguiſed like ſatyrs, in linen clothes covered with roſin, and while warm ſtuck over with down. Theſe were the king and five of his lords. The ducheſs of Berri paid attention to the king, though ſhe did not know him, and engaged in converſation with him. In the mean time the duke of Orleans ignorant of the conſequence, out of diverſion ran a lighted torch againſt one of them. His whole dreſs was inſtantly in a flame, and the fire was from him communicated to all the reſt. The maſques, notwithſtanding the dreadful ſituation they were in, called out, "Save the king; ſave the king!" on which the ducheſs of Berri, recollecting that it muſt be him with whom ſhe had engaged in converſation, wrapped him in her cloak, and preſerved him from further danger. Only one of the reſt eſcaped by jumping into a ciſtern of water; the other four periſhed in the flames. The terror which the king underwent by this accident inſtantly occaſioned a relapſe; and he continued delirious at intervals as long as he lived. During this ſtate of inſanity he was untractable by every perſon except Valentina ducheſs of Orleans; who ſeemed to have as great an influence over him as her huſband the duke had over the mind of the queen. So great was the power indeed which ſhe had over the king in this deplorable ſtate, that in thoſe ſuperſtitious times it was ſuppoſed by many to be the effect of magic. Others, with more probability, aſcribed it to her ſuperior charms as a woman; and this idea inſtantly produced her a number of enemies among her own ſex, the ducheſs of Burgundy particularly; and the quarrel between the two ladies, ſoon extended itſelf to their huſbands. Amidſt their diſſenſions, however, they did not entirely neglect the adminiſtration of public affairs; they ſtrove to conciliate the affection of the parliament by preſerving the rights of the commons inviolate; and they endeavoured to check an inordinate paſſion for gaming which began to appear about this time, and to ſubſtitute manly and martial exerciſes in its place.

89 Diſturbances about a regency.

90 An accident occaſions a relapſe in the king.

During the intervals of his reaſon, Charles frequently aſſumed the government into his own hands: and as the war ſtill continued with England, though in a languid manner, the French monarch, in one of theſe lucid intervals, had an interview with Richard king of England, in order to put an end to hoſtilities, of which both were equally weary. Still, however, their claims were ſo difficult to be adjuſted, that they could do no more than conclude a truce for 25 years; during which ſpace it was hoped that a laſting peace might take place. Richard gave up Cherburg to Charles, and Breſt to the duke of Brittany: a marriage was alſo concluded betwixt the king of England and Iſabella the daughter of Charles, though the latter was then only ſeven years of age; but by reaſon of the tender age of the princeſs, this marriage was never conſummated.

France. 91 Interview betwixt the kings of France and England.

During this unfortunate reign, France was ſtill farther weakened by the ſuccours ſent to the Hungarians againſt the Turks. On this fatal expedition upwards of 1000 of the braveſt and moſt experienced knights were ſent under the conduct of John count of Nevers, eldeſt ſon of the duke of Burgundy; the count of Eu, conſtable of France; John de Vienne, admiral of France; and the count of Marche, a prince of the blood royal; together with De Courcy, one of the beſt and moſt experienced captains in Chriſtendom. The prudent counſels of this veteran, however, were not obeyed by the youthful warriors by whom he was accompanied. Attacking the enemy therefore raſhly, and while heated with wine, they were all either killed or taken priſoners. Notwithſtanding this diſaſter, however, aſſiſtance was ſent in the year 1400 to Wanceſlaus emperor of Germany; and the duke of Orleans, who commanded the army on this occaſion, acquitted himſelf ſo well that he acquired the duchy of Luxemburg for himſelf, and left his ally ſatisfied: but while the friendſhip of France was thus courted by foreign powers, the kingdom itſelf was in the moſt miſerable ſituation. The king's diſtemper ſeemed daily to gain ground; while the diſcordant intereſts of the contending parties kept the whole nation in a ferment. The moſt violent animoſity took place betwixt the dukes of Orleans and Burgundy. The former, by means of his own intereſt with the queen, and the aſcendency his ducheſs had over the king, for ſome time got the better of his rival, and was made lieutenant general and governor of the kingdom; but having preſumed on his power to levy new impoſts on the people, and oppreſſing alſo the churchmen, whom in that ſuperſtitious age he ought by all means to have let alone, he was deprived of his authority, and obliged to yield to the duke of Burgundy. For ſome time, however, theſe powerful rivals were kept within ſome bounds by the mediation of the duke of Bourbon, who ſeems to have been the only grandee who maintained a pure and unſpotted character; but by his death in 1404, the unhappy nation was left totally expoſed to their relentleſs fury. In 1405, the queen and duke of Orleans again ſeized the adminiſtration; but were ſoon deprived of it by the unanimous voice of the people. During this period Charles and his children were neglected and abandoned to diſtreſs; but they were relieved by the duke of Burgundy on his obtaining the regency; and Iſabella, with the duke of Orleans, was obliged to retire from Milan. A ſudden return of the king's reaſon and underſtanding for a much longer time than uſual, now deprived both parties of their power; and the adminiſtration

92 Unhappy fate of the ſuccours ſent to the Hungarians.

93 Violent commotions in France.

France. niſtration was veſted in the queen and a council compoſed of princes of the blood.

The two rival dukes, thus prohibited from interfering in public affairs, exerciſed themſelves in committing hoſtilities againſt the Engliſh, with whom the truce had been lately concluded. They were encouraged to this infraction of the treaty by the unſettled ſituation of the affairs of Henry IV.; but their attempts proving unſucceſsful, the truce was renewed after obtaining reſtoration of the princeſs, who had been married to Richard II. as has been already mentioned. The failure of their enterpriſes produced a new ſcene of diſcord betwixt the dukes, who mutually threw the blame upon each other. By the entreaties of the duke of Berry they were apparently reconciled; but the duke of Burgundy pretended friendſhip only in order to take
94 the more ſignal vengeance. To this he was now fur-
Duke of Orleans aſſaſſinated. ther inflamed by jealouſy. Having hired a band of ruffians to execute his bloody purpoſe, the duke was one evening attacked by eighteen of them while attended only by two pages. A Norman gentleman whom the duke had deprived of an employment, headed the aſſaſſins, and in perſon attacked the duke. At the firſt blow he cut off his hand, at the ſecond he ſtruck him from his mule, and at the third put an end to his life. His wife Valentina was ſo deeply affected with his death, that ſhe died ſoon after. The duke of Burgundy eſcaped to Flanders; and the whole nation was rent into two factions, called the *Burgundians* and *Armagnacs;* the latter being the title of the party of the duke of Orleans, from Armagnac the father-in-law of that prince. A dreadful confuſion enſued: the duke of Burgundy ſoon returned to France, and extorted a pardon from the unhappy king, who was now no longer able to reſiſt him: and we may have ſome notion of the ſtate of the kingdom in general from being told, that 2000 people periſhed in one tumult in the capital. The king himſelf was alternately the priſoner of each party, and alternately transferred the power from the one to the other as he happened to fall into their hands. This therefore was thought by Henry V. of England, a favourable opportunity to recover from France thoſe grants that had been formerly given up by treaty. But previouſly, to give his intended expedition the appearance of juſtice, he ſent over ambaſſadors to Paris, offering a perpetual peace and alliance, on condition of being put in poſſeſſion of all thoſe provinces which had been raviſhed from the Engliſh during ſome former reigns, and of eſpouſing Catharine, the French king's daughter, in marriage, with a ſuitable dowry. Though the French court was at that time extremely averſe to war, yet the exorbitance of theſe demands could not be complied with; and Henry
95 very probably made them in hopes of a denial. He
Invaſion by Henry V. of England. therefore aſſembled a great fleet and army at Southampton; and having allured all the military men of the kingdom to attend him, from the hopes of conqueſt, he put to ſea, and landed at Harfleur, at the head of an army of 6000 men-at-arms, and 24,000 foot, moſtly archers.

His firſt operations were upon Harfleur; which being preſſed hard, promiſed at a certain day to ſurrender unleſs relieved before that time. The day arriving, and the garriſon, unmindful of their engagement, ſtill reſolving to defend the place, Henry ordered an aſſault to be made, took the town by ſtorm, and put all the garriſon to the ſword. From thence the victor advanced farther into the country, which had been already rendered deſolate by factions, and which he now totally laid waſte. But although the enemy made a feeble reſiſtance; yet the climate ſeemed to fight againſt the Engliſh; a contagious dyſentery carrying off three parts of Henry's army. In this ſituation he had recourſe to an expedient common enough in that barbarous age, to inſpire his troops with confidence in their general. He challenged the dauphin, who commanded in the French army, to ſingle combat, offering to ſtake his pretenſions on the event. This challenge, as might naturally be expected, was rejected; and the French, though diſagreeing internally, at laſt ſeemed to unite at the appearance of the common danger. A numerous army of 14,000 men-at-arms, and 40,000 foot, was by this time aſſembled under the command of Count Albert, and was now placed to intercept Henry's weakened forces on their return. The Engliſh monarch, when it was too late, began to repent of his raſh inroad into a country where diſeaſe and a powerful army everywhere threatened deſtruction; he therefore thought of retiring into Calais. In this retreat, which was at once both painful and dangerous, Henry took every precaution to inſpire his troops with patience and perſeverance; and ſhowed them in his own perſon the brighteſt example of fortitude and reſignation. He was continually haraſſed on his march by flying parties of the enemy; and whenever he attempted to paſs the river Somme, acroſs which his march lay, he ſaw troops on the other ſide ready to oppoſe his paſſage. However, he was ſo fortunate as to ſeize by ſurpriſe a paſſage near St Quintin, which had not been ſufficiently guarded; and there he ſafely carried over his army.

But the enemy was ſtill reſolved to intercept his retreat: and after he had paſſed the ſmall river of Tertrois at Blangi, he was ſurpriſed to obſerve from the heights the whole French army drawn up in the plains
96 of Agincourt; and ſo poſted, that it was impoſſible for
Battle of Agincourt. him to proceed on his march, without coming to an engagement. A battle accordingly took place, in which the Engliſh gained a victory, the moſt remarkable perhaps of any recorded in hiſtory; an account of which is given under the article AGINCOURT.

This victory, gained on the 25th of October 1415, was however attended with no immediate effects. Henry ſtill continued to retreat, after the battle of Agincourt, out of the kingdom; and carried his priſoners to Calais, and from thence to England. In
97 1417, he once more landed an army of 25,000 men
Henry lands again in Normandy. in Normandy; and prepared to ſtrike a deciſive blow for the crown of France, to which the Engliſh monarchs had long made pretenſions. That wretched country was now in a moſt deplorable ſituation. The whole kingdom appeared as one vaſt theatre of crimes, murders, injuſtice, and devaſtation. The duke of Orleans was aſſaſſinated by the duke of Burgundy; and the duke of Burgundy, in his turn, fell by the treachery of the dauphin. At the ſame time, the duke's ſon, deſirous of revenging his father's death, entered into a ſecret treaty with the Engliſh; and a league was immediately concluded at Arras, between Henry and the young duke of Burgundy, in which the king promiſed

France. miſed to revenge the murder of the late duke; and the ſon ſeemed to inſiſt upon no further ſtipulations. Henry, therefore, proceeded in his conqueſts without much oppoſition from any quarter. Several towns and provinces ſubmitted on his approach; the city of Rouen was beſieged and taken: and he ſoon became maſter of Pontoiſe and Giſors. He even threatened Paris by the terror of his power, and obliged the court to remove to Troyes. It was at this city that the duke of Burgundy, who had taken upon him the protection of the French king, met Henry in order to ratify that treaty which was formerly begun, and by which the crown of France was to be transferred to a ſtranger. The imbecility into which Charles had fallen, made him paſſive in this remarkable treaty; and Henry dictated the terms throughout the whole negociation. The principal articles of this treaty were, That Henry ſhould eſpouſe the princeſs Catharine; that King Charles ſhould enjoy the title and dignity of king for life; but that Henry ſhould be declared heir to the crown, and ſhould be intruſted with the preſent adminiſtration of the government; that France and England ſhould for ever be united under one king, but ſhould ſtill retain their reſpective laws and privileges; that Henry ſhould unite his arms with thoſe of King Charles and the duke of Burgundy, to depreſs and ſubdue the dauphin and his partiſans.

98 He marries the Princeſs Catharine. It was not long after this treaty, that Henry married the princeſs Catharine; after which he carried his father-in-law to Paris, and took a formal poſſeſſion of that capital. There he obtained from the eſtates of the kingdom a ratification of the late compact; and then turned his arms with ſucceſs againſt the adherents of the dauphin; who, in the mean time, wandered about a ſtranger in his own patrimony, and to his enemies ſucceſſes only oppoſed fruitleſs expoſtulations.

Henry's ſupplies were not provided in ſuch plenty as to enable him to carry on the war without returning in perſon to prevail upon his parliament for freſh ſuccours; and, upon his arrival in England, though he found his ſubjects highly pleaſed with the ſplendour of his conqueſts, yet they ſeemed ſomewhat doubtful as to the advantage of them. A treaty, which in its conſequences was likely to transfer the ſeat of empire from England, was not much reliſhed by the parliament. They therefore, upon various pretences, refuſed him a ſupply equal to his exigencies or his demands; but he was reſolved on purſuing his ſchemes; and, joining to the ſupplies granted at home, the contributions levied on the conquered provinces, he was able once more to aſſemble an army of 28,000 men, and with theſe he landed ſafely at Calais.

In the mean time, the dauphin, a prince of great prudence and activity, omitted no opportunity of repairing his ruined ſituation, and to take the advantage of Henry's abſence from France. He prevailed upon the regent of Scotland to ſend him a body of 8000 men from that kingdom; and with theſe, and ſome few forces of his own, he attacked the duke of Clarence, who commanded the troops in Henry's abſence, and gained a complete victory.

This was the firſt action which turned the tide of ſucceſs againſt the Engliſh. But it was of ſhort duration: for Henry ſoon after appearing with a conſiderable army, the dauphin fled at his approach; while many of the places, which held out for the dauphin in the neighbourhood of Paris, ſurrendered to the conqueror. In this manner, while Henry was everywhere victorious, he fixed his reſidence at Paris; and while Charles had a ſmall court, he was attended with a very magnificent one. On Whitſunday 1421, the two kings and their two queens with crowns on their heads dined together in public; Charles receiving apparent homage, but Henry commanding with abſolute authority. France.

In the mean time, the dauphin was purſued beyond the Loire, and almoſt totally diſpoſſeſſed of all the northern provinces. He was even purſued into the ſouth, by the united arms of the Engliſh and Burgundians, and threatened with total deſtruction. In this exigence, he found it neceſſary to ſpin out the war, and to evade all hazardous actions with a rival who had been long accuſtomed to victory. His prudence was everywhere remarkable; and, after a train of long perſecutions from fortune, he found her at length willing to declare in his favour, by the death of the king of England.

99 Death of Henry and Charles. Charles VI. died a ſhort time after; and Charles VII. ſucceeded his father to a nominal throne. Nothing could be more deplorable than the ſituation of that monarch on aſſuming his title to the crown. The Engliſh were maſters of almoſt all France; and Henry VI. though yet but an infant, was ſolemnly inveſted with regal power by legates from Paris. The duke of Bedford was at the head of a numerous army, in the heart of the kingdom, ready to oppoſe every inſurrection; while the duke of Burgundy, who had entered into a firm confederacy with him, ſtill remained ſtedfaſt, and ſeconded his claims. Yet notwithſtanding theſe favourable appearances, Charles found means to break the leagues formed againſt him, and to bring back his ſubjects to their natural intereſts and their duty.

100 Deſperate ſituation of Charles VII. However, his firſt attempts were totally deſtitute of ſucceſs. Wherever he endeavoured to face the enemy he was overthrown, and he could ſcarcely rely on the friends next his perſon. His authority was inſulted even by his own ſervants; advantage after advantage was gained againſt him; and a battle fought near Verneuil, in which he was totally defeated by the duke of Bedford, ſeemed to render his affairs altogether deſperate. But from the impoſſibility of the Engliſh keeping the field without new ſupplies, Bedford was obliged to retire into England; and in the mean time, his vigilant enemy began to recover from his late conſternation. Dumois, one of his generals, at the head of 1000 men, compelled the earl of Warwick to raiſe the ſiege of Montargis; and this advantage, ſlight as it was, began to make the French ſuppoſe that the Engliſh were not invincible.

101 The French affairs retrieved by the Maid of Orleans. But they ſoon had ſtill greater reaſon to triumph in their change of fortune, and a new revolution was produced by means apparently the moſt unlikely to be attended with ſucceſs. In the village of Domremi, near Vaucouleurs, on the borders of Lorrain, there lived a country girl, about 27 years of age, called *Joan de Arc*. This girl had been a ſervant at a ſmall inn; and in that humble ſtation had ſubmitted to thoſe hardy employments which fit the body for the fatigues of war. She was of an irreproachable life, and had hi-

France. therto teſtified none of thoſe enterpriſing qualities which diſplayed themſelves ſoon after. She contentedly fulfilled the duties of her ſituation, and was remarkable only for her modeſty and love of religion. But the miſeries of her country ſeemed to have been one of the greateſt objects of her compaſſion and regard. Her mind, inflamed by theſe objects, and brooding with melancholy ſtedfaſtneſs upon them, began to feel ſeveral impulſes, which ſhe was willing to miſtake for the inſpirations of heaven. Convinced of the reality of her own admonitions, ſhe had recourſe to one Baudricourt, governor of Vaucouleurs, and informed him of her deſtination by heaven to free her native country of its fierce invaders. Baudricourt treated her at firſt with neglect: but her importunities at length prevailed; and willing to make a trial of her pretenſions, he gave her ſome attendants, who conducted her to the court, which at that time reſided at Chinon.

The French court were probably ſenſible of the weakneſs of her pretenſions; but they were willing to make uſe of every artifice to ſupport their declining fortunes. It was therefore given out, that Joan was actually inſpired; that ſhe had been able to diſcover the king among the number of his courtiers, although he had laid aſide all the diſtinctions of his authority; that ſhe had told him ſome ſecrets, which were only known to himſelf; and that ſhe had demanded, and minutely deſcribed, a ſword in the church of St Catharine de Fierbois, which ſhe had never ſeen. In this manner, the minds of the vulgar being prepared for her appearance, ſhe was armed cap-a-pee, and ſhown in that martial dreſs to the people. She was then brought before the doctors of the univerſity; and they, tinctured with the credulity of the times, or willing to ſecond the impoſture, declared that ſhe had actually received her commiſſion from above.

When the preparations for her miſſion were completely blazoned, the next aim was to ſend her againſt the enemy. The Engliſh were at that time beſieging the city of Orleans, the laſt reſource of Charles, and every thing promiſed them a ſpeedy ſurrender. Joan undertook to raiſe the ſiege; and to render herſelf ſtill more remarkable, girded herſelf with the miraculous ſword, of which ſhe before had ſuch extraordinary notices. Thus equipped, ſhe ordered all the ſoldiers to confeſs themſelves before they ſet out; ſhe diſplayed in her hand a conſecrated banner, and aſſured the troops of certain ſucceſs. Such confidence on her ſide ſoon raiſed the ſpirits of the French army; and even the Engliſh, who pretended to deſpiſe her efforts, felt themſelves ſecretly influenced with the terrors of her miſſion. A ſupply of proviſions was to be conveyed into the town; Joan, at the head of ſome French troops, covered the embarkation, and entered Orleans at the head of the convoy which ſhe had ſafely protected. While ſhe was leading her troops along, a dead ſilence and aſtoniſhment reigned among the Engliſh; and they regarded with religious awe that temerity, which they thought nothing but ſupernatural aſſiſtance could inſpire. But they were ſoon roufed from their ſtate of amazement by a ſally from the town; Joan led on the beſieged, bearing the ſacred ſtandard in her hand, encouraging them with her words and actions, bringing them to the trenches, and overpowering the beſiegers in their own redoubts. In the attack of one of the forts, ſhe was wounded in the neck with an arrow; but inſtantly pulling out the weapon with her own hands, and getting the wound quickly dreſſed, ſhe haſtened back to head the troops, and to plant her victorious banner on the ramparts of the enemy. Theſe ſucceſſes continuing, the Engliſh found that it was impoſſible to reſiſt troops animated by ſuch ſuperior energy; and Suffolk, who conducted the attack, thinking that it might prove extremely dangerous to remain any longer in the preſence of ſuch a courageous and victorious enemy, raiſed the ſiege, and retreated with all imaginable precaution. France.

From being attacked, the French now in turn became the aggreſſors. Charles formed a body of 6000 men, and ſent them to beſiege Jergeau, whither the Engliſh, commanded by the earl of Suffolk, had retired, with a detachment of his army. The city was taken; Suffolk yielded himſelf a priſoner; and Joan marched into the place in triumph at the head of the army. A battle was ſoon after fought near Patay, where the Engliſh were worſted, as before; and the generals Scales and Talbot were taken priſoners.

The raiſing of the ſiege of Orleans was one part of the Maid's promiſe to the king of France; the crowning him at Rheims was the other. She now declared that it was time to complete that ceremony; and Charles, in purſuance of her advice, ſet out for Rheims at the head of 12,000 men. The towns through which he paſſed opened their gates to receive him; and Rheims ſent him a deputation, with its keys, upon his approach. The ceremony of his coronation was there performed with the utmoſt ſolemnity; and the *Maid of Orleans* (for ſo ſhe was now called) ſeeing the completion of her miſſion, deſired leave to retire, alleging that ſhe had now accompliſhed the end of her calling. But her ſervices had been ſo great, that the king could not think of parting with her; he preſſed her to ſtay ſo earneſtly, that ſhe at length complied with his requeſt.

A tide of ſucceſſes followed the performance of this ſolemnity; Laon, Soiſſons, Chateau-Thierri, Provins, and many other fortreſſes in that neighbourhood, ſubmitted to him on the firſt ſummons. On the other hand, the Engliſh, diſcomfited and diſpirited, fled in every quarter; not knowing whether to aſcribe their misfortunes to the power of ſorcery or to a celeſtial influence; but equally terrified at either. They now found themſelves deprived of the conqueſts they had gained, in the ſame manner as the French had formerly ſubmitted to their power. Their own diviſions, both abroad and at home, unfitted them entirely for carrying on the war; and the duke of Bedford, notwithſtanding all his prudence, ſaw himſelf diveſted of his ſtrong holds in the country, without being able to ſtop the enemy's progreſs. In order, therefore, to revive the declining ſtate of his affairs, he reſolved to have Henry crowned king at Paris, knowing that the natives would be allured to obedience by the ſplendour of the ceremony. In 1430, Henry was accordingly crowned, all the vaſſals that ſtill continued under the Engliſh power ſwearing fealty and homage. But it was now too late for the ceremonies of a coronation to give a turn to the affairs of the Engliſh; the generality of the kingdom had declared againſt them, and the remainder 102 Henry VI. of England crowned king of France.

France. remainder only waited a convenient opportunity to follow the example.

An accident enſued ſoon after, which, though it promiſed to promote the Engliſh cauſe in France, in the end ſerved to render it odious, and conduced to the total evacuation of that country. The duke of Burgundy, at the head of a powerful army, had laid ſiege to Compeign; and the Maid of Orleans had thrown herſelf into the place, contrary to the wiſhes of the governor, who did not deſire the company of one whoſe authority would be greater than his own. The garriſon, however, were rejoiced at her appearance, and believed themſelves invincible under her protection. But their joy was of ſhort duration; for Joan having the day after her arrival headed a ſally, and twice driven the enemy from their intrenchments, ſhe was at laſt obliged to retire, placing herſelf in the rear, to protect the retreat of her forces. But in the end, attempting to follow her troops into the city, ſhe found the gates ſhut, and the bridge drawn up by order of the governor, who is ſaid to have long wiſhed for an opportunity of delivering her up to the enemy.

103 Maid of Orleans taken priſoner,

Nothing could exceed the joy of the beſiegers, in having taken a perſon who had been ſo long a terror to their arms. The ſervice of Te Deum was publicly celebrated on this occaſion; and it was hoped, that the capture of this extraordinary perſon would reſtore the Engliſh to their former victories and ſucceſſes. The duke of Bedford was no ſooner informed of her being taken, than he purchaſed her of the Count Vendome, who had made her his priſoner, and ordered her to be committed to cloſe confinement. The credulity of both nations was at that time ſo great, that nothing was too abſurd to gain belief that coincided with their paſſions. As Joan but a little before, from her ſucceſſes, was regarded as a ſaint, ſhe was now, upon her captivity, conſidered as a ſorcereſs, forſaken by the demon who had granted her a fallacious and temporary aſſiſtance. Accordingly it was reſolved in council to ſend her to Rouen to be tried for witchcraft: and the biſhop of Beauvais, a man wholly devoted to the Engliſh intereſt, preſented a petition againſt her for that purpoſe. The univerſity of Paris was ſo mean as to join in the ſame requeſt. Several prelates, among whom the cardinal of Wincheſter was the only Engliſhman, were appointed as her judges. They held their court at Rouen, where Henry then reſided; and the Maid, clothed in her former military apparel, but loaded with irons, was produced before the tribunal. Her behaviour there no way diſgraced her former gallantry; ſhe betrayed neither weakneſs nor womaniſh ſubmiſſion; but appealed to God and the pope for the truth of her former revelations. In the iſſue, ſhe was found guilty of hereſy and witchcraft; and ſentenced to be burnt alive, the common puniſhment for ſuch offences.

But previous to the infliction of this dreadful ſentence upon her, they were reſolved to make her abjure her former errors; and at length ſo far prevailed upon her, by terror and rigorous treatment, that her ſpirits were entirely broken by the hardſhips ſhe was obliged to ſuffer. Her former viſionary dreams began to vaniſh, and a gloomy diſtruſt to take place of her late inſpirations. She publicly declared herſelf willing to recant, and promiſed never more to give way to the vain deluſions which had hitherto miſled her, and impoſed on the people. This was what her oppreſſors deſired; and willing to ſhow ſome appearance of mercy, they changed her ſentence into perpetual impriſonment, and to be fed during life on bread and water. But the rage of her enemies was not yet ſatiated. Suſpecting that the female dreſs which ſhe had conſented to wear, was diſagreeable to her, they purpoſely placed in her apartment a ſuit of men's apparel, and watched for the effect of their temptation upon her. Their cruel artifices prevailed. Joan, ſtruck with the ſight of a dreſs in which ſhe had gained ſo much glory, immediately threw off her penitent robes, and put on the forbidden garment. Her enemies caught her equipped in this manner; and her imprudence was conſidered as a relapſe into her former tranſgreſſions. No recantation would ſuffice, and no pardon would be granted. She was condemned to be burnt alive in the market-place of Rouen; and this infamous ſentence was accordingly executed with moſt brutal ſeverity. France. 104 and cruelly put to death.

One of the firſt misfortunes which the Engliſh felt after this puniſhment, was the defection of the duke of Burgundy; who had for ſome time ſeen the error of his conduct, and wiſhed to break an unnatural connexion, that only ſerved to involve his country in ruin. A treaty was therefore begun and concluded between him and Charles, in which the former agreed to aſſiſt him in driving the Engliſh out of France. This was a mortal blow to their cauſe; and ſuch was its effects upon the populace of London when they were informed of it, that they killed ſeveral of the duke of Burgundy's ſubjects, who happened to be among them at the time. It might perhaps alſo have haſtened the duke of Bedford's death, who died at Rouen a few days after the treaty was concluded; and the earl of Cambridge was appointed his ſucceſſor to the regency of France.

105 Affairs of the Engliſh totally ruined.

From this period, the Engliſh affairs became totally irretrievable. The city of Paris returned once more to a ſenſe of its duty. Lord Willoughby, who commanded it for the Engliſh, was contented to ſtipulate for the ſafe retreat of his troops to Normandy. Thus ground was continually, though ſlowly, gained by the French; and notwithſtanding their fields were laid waſte, and their towns depopulated, yet they found protection from the weakneſs and diviſions of the Engliſh. At length both parties began to grow weary of a war, which, though carried on but feebly, was yet a burden greater than either could ſupport. But the terms of peace inſiſted upon by both were ſo wide of each other, that no hopes of an accommodation could quickly be expected. A truce, therefore, for twenty-two months, was concluded in 1443, which left every thing on the preſent footing between the parties. No ſooner was this agreed upon, than Charles employed himſelf with great induſtry and judgment in repairing thoſe numberleſs ills to which his kingdom, from the continuance of wars both foreign and domeſtic, had ſo long been expoſed. He eſtabliſhed diſcipline among his troops, and juſtice among his governors. He revived agriculture, and repreſſed faction. Thus being prepared once more for taking the field, he took the firſt favourable occaſion of breaking the truce; and Normandy was at the ſame time invaded by four

France. powerful armies; one commanded by Charles himſelf, a ſecond by the duke of Brittany, a third by the count of Alençon, and a fourth by the Count Dunois. Every place opened its gates almoſt as ſoon as the French appeared before them. Rouen was the only one that promiſed to hold out a ſiege; but the inhabitants clamoured ſo loud for a ſurrender, that the duke of Somerſet, who commanded the garriſon, was obliged to capitulate. The battle, or rather the ſkirmiſh, of Fourmingi, was the laſt ſtand which the Engliſh made in defence of their French dominions. However, they were put to the rout, and above a thouſand were ſlain. All Normandy and Guienne, that had ſo long acknowledged ſubjection to England, were loſt in the ſpace of a year; and the Engliſh ſaw themſelves entirely diſpoſſeſſed of a country which for above three centuries they had conſidered as annexed to their native dominions. Calais alone remained of all their conqueſts; and this was but a ſmall compenſation for the blood and treaſure which had been laviſhed in that country, and only ſerved to gratify ambition with a tranſient applauſe.

Thus, in the year 1450, the power of the Engliſh in France was entirely deſtroyed; and Charles deſervedly obtained the ſurname of *Victorious*, on account of the vigour he had ſhown in driving out the invaders of his country. His ſatisfaction, however, was now greatly diminiſhed by domeſtic misfortunes. The dauphin, forgetting the allegiance and filial duty he owed to his father, had already impeded his conqueſts by his ſeditious intrigues. He had uſed every endeavour to thwart the deſigns of his miniſters, and it was ſuppoſed that he had deſtroyed Agnes Soreille his father's favourite miſtreſs by poiſon. He had married Charlotte daughter to the duke of Savoy; which Charles had reſented by a declaration of war againſt the duke, but had been perſuaded to recal it in order to proſecute the war againſt Guienne, which made part of the dominions of the Engliſh. At laſt, weary of the diſobedience of his ſon, he commanded him to be arreſted; but Louis, informed of his deſign, withdrew to Franche Comte, and afterwards to Brabant; of which the duke of Burgundy (at this time ſovereign of the country) was no ſooner appriſed, than he ordered him to be ſupplied with every neceſſary, and treated with all imaginable reſpect. He refuſed to ſee him, however, until he ſhould obtain the approbation of his father; on which Louis, having in vain attempted to draw the duke into a participation of his crimes, employed himſelf in ſowing diſſenſion betwixt his benefactor and his ſon the count of Charolois, at the very time that he himſelf was receiving a penſion of 12,000 crowns annually from the father. Thus he at laſt deſtroyed the domeſtic peace of his benefactor, while his unnatural behaviour created continual ſuſpicions in the mind of his father. Charles was repeatedly informed that his own domeſtics, along with his undutiful ſon, were in a conſpiracy againſt his life. The miſerable monarch, therefore, in continual fear of being poiſoned, and having none in whom he could repoſe any confidence, obſtinately refuſed for ſome days to take any nouriſhment; and when at laſt prevailed upon by the importunities of his attendants to do ſo, his ſtomach had become incapable of receiving food, ſo that he died for want of ſuſtenance in the year 1461. His body, neglected by his unnatural ſon, was interred at the expence of Tannegui de Chaſtel, who had been his faithful companion.

106 Domeſtic misfortunes and death of Charles.

France. 107 Reign of Louis XI.

On the death of Charles, his ſon Louis ſucceeded to the throne, to which he had ſo long aſpired. He was reckoned one of the greateſt politicians that ever exiſted; though his character was not on that account the more amiable; on the contrary, there are few princes whoſe hiſtory appears in a more deteſtable light. So deſtitute was he of natural affection, that he did not even attempt to conceal his joy at his father's death. He pretended much friendſhip for the count of Charolois, ſon to the duke of Burgundy, on account of the protection he had received at his father's court; and even conferred upon him a penſion of 12,000 crowns annually: but all this ſhow of affection ſoon degenerated into a mortal averſion on both ſides. Some differences which took place between the courts of France and Caſtile produced an interview betwixt the two monarchs, Louis, and Henry ſurnamed the *Impoteni*. They met at Mauleon on the confines of Navarre: but their negotiations came to nothing, and they parted with a mutual contempt of each other; Henry deſpiſing the mean and ſordid appearance of Louis, as he in his turn did the gaudy magnificence of Henry. In his negotiations with the duke of Burgundy, Louis proved more ſucceſsful; perſuading him to reſtore ſome towns on the river Somme, which had been ceded by Charles VII. and by the poſſeſſion of which the duke was in effect maſter of Picardy. This ceſſion was oppoſed by the count of Charolois; but Louis, by corrupting John de Croy the duke's miniſter, obtained his end; and for the ſum of 400,000 crowns the cities were delivered to him. By this tranſaction he effectually enſured the hatred of Charolois: and even in that very tranſaction the duplicity of Louis was eminently diſplayed; for though he had agreed to retain in thoſe towns the officers appointed by the duke, he was no ſooner in poſſeſſion of them than he diſplaced them all, and nominated others in their ſtead.

108 Formidable confederacy againſt Louis.

The duchy of Brittany was at this time governed by Francis, a weak but generous prince, and whoſe defect of capacity was ſupplied by the abilities of his miniſters. Him Louis inſulted in the moſt grievous manner; and as Francis found himſelf unable to oppoſe ſuch a powerful adverſary alone, he joined in a cloſe alliance with the duke of Burgundy and the count of Charolois; the latter having been grievouſly offended with Louis, and even accuſed him of attempting his life. The conſpiracy was joined by ſeveral of the principal French nobility, who had been oppreſſed by the king; and though the ſecret was confided to upwards of 500 perſons, not one of them ever divulged it. Louis, finding matters become very critical, marched with an army towards the capital, which the count of Charolois already inſulted. A battle enſued, in which both princes exerted themſelves to the utmoſt, though their valour was but ill ſeconded by the bravery of their troops. About 1500 periſhed on each ſide; but the count of Charolois remained maſter of the field of battle. Louis, however, after this engagement, entered the capital: where he endeavoured, by every kind conceſſion he could think of, to conciliate the affection of his ſubjects; in which he ſucceeded ſo well, that though the army of inſurgents was

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was ſoon augmented to more than 100,000 men, they were unable to make themſelves maſters of the city. At laſt a treaty was ſet on foot betwixt Louis and the count of Charolois; by which the latter obtained the towns which had been formerly ceded, with the diſtricts of Boulogne, Guiſne, Peronne, Mondidior, and Royc, as a perpetual inheritance for himſelf. By granting favours to the other confederates, the league was broken; and the moment that Louis found himſelf freed from danger, he proteſted againſt the whole treaty in the preſence of ſome confidential members of parliament, as contrary to the intereſt of the crown; and therefore waited the firſt favourable opportunity to cruſh one by one thoſe who had been ready by their united efforts to deſtroy himſelf. The duke of Bourbon, one of the moſt able of the confederates, was gained over, by beſtowing upon him in marriage, Jane the natural daughter of Louis himſelf, with the dowry of Uſſon in Auvergne; together with Moras, Beaurepaire, and Cormillon in Dauphiny; while, by the diſcontents betwixt the dukes of Brittany and Normandy, he was enabled to ſecure the neutrality of the former, and to recover from the latter ſome territories which he had unwillingly ceded to him.

109 Peace concluded.

110 Treachery of Louis.

In 1467, Philip duke of Burgundy, from his amiable qualities ſurnamed *The Good*, died, and left his dominions to his ſon Charles count of Charolois. That fiery and impetuous prince, jealous of the growing power of France, and an implacable enemy of Louis, had entered into a ſecret treaty with Francis; but Louis had driven the Bretons from the poſts they occupied in Normandy before the duke of Burgundy could paſs the Somme. The king, however, alarmed at the power of the confederates, concluded a peace with Brittany; and, confiding in his talents for negotiation, determined to have a perſonal interview with the duke of Burgundy.

111 Louis impriſoned by Charles.

This memorable interview took place in the year 1468; and Peronne, a city of Picardy, but belonging to the duke of Burgundy, was appointed as the place of rendezvous. To this place the politic Louis repaired with a ſlender train, and attended only by Cardinal Balue, the duke of Bourbon, and the count de St Pol, conſtable of France; ſeemingly without reflecting that he was entering a hoſtile city, where he might be confined for any length of time, or treated at the pleaſure of the duke, who was his mortal enemy. Indeed he had not long been in the place when he began to ſee the error of his conduct; and by the daily concourſe of Burgundian lords and other perſons of rank, who were his avowed enemies, he became alarmed for his perſonal ſafety. His fear now ſuggeſted to him a worſe meaſure than even the former; and he requeſted apartments in the caſtle, where it was in the power of his rival in a moment to make him a cloſe priſoner. This event accordingly took place, and that through the arts and machinations of Louis himſelf. His deſign had been from the beginning to keep the duke of Burgundy conſtantly employed in domeſtic wars. For this purpoſe he had, before his interview with Charles, excited the inhabitants of Liege, who were ſubject to the duke of Burgundy, to revolt. It is moſt probable, that he did not imagine the effects of this treachery would ſo ſoon begin to appear. At the very time, however, that Louis was in the caſtle of Peronne, the people of Liege revolted, ſeized the biſhop and governor; and having maſſacred great numbers of the adherents of Charles, retired with the priſoners they had made to the capital. Charles was ſoon informed of this maſſacre, with the additional circumſtance, that the ambaſſadors of Louis were ſeen animating the inſurgents to their work of deſtruction. He then flew into a tranſport of rage; commanded the gates of the caſtle to be ſhut and ſtrictly guarded; denouncing the ſevereſt vengeance on the perfidious monarch who had ſo often deceived him. Louis, however, though greatly, and no doubt very juſtly, alarmed, did not neglect to take the proper methods for ſecuring himſelf. He diſtributed large ſums of money among thoſe officers to whom he imagined the duke was moſt inclined to pay any regard, and by ſplendid promiſes and preſents endeavoured to allay the reſentment of his other enemies. At laſt the reſentment of Charles having ſubſided, he entered into a treaty with the king, and concluded it upon much the ſame terms as thoſe which had been agreed upon before. His reſentment, however, ſtill manifeſted itſelf ſo far, that he inſiſted upon Louis being preſent at the puniſhment he inflicted upon the inhabitants of Liege for the maſſacre they had committed, and of which we have already taken notice. This was agreed to: the two princes formed the ſiege of the city in conjunction; and, notwithſtanding the obſtinate defence of the people, it was at laſt taken by ſtorm, and the inhabitants maſſacred. It was not long, however, before the new alliance was diſſolved. A confederacy againſt Louis, whom neither promiſes nor treaties could bind, was formed betwixt his own brother the duke of Normandy and the duke of Burgundy; but before their meaſures were ripe for execution, Louis had already commenced hoſtilities. The duke of Burgundy, as a peer of France, was ſummoned to parliament; and on his refuſal, the conſtable St Pol made himſelf maſter of St Quintin. Several other cities were ſoon after reduced; and Baldwin, the natural brother of Charles, corrupted by Louis, deſerted his cauſe; and the haughty ſpirit of the duke was thus at laſt obliged to condeſcend to ſolicit a peace. This, however, was of no long duration. Charles, encouraged by the ſucceſs of Edward IV. of England his brother-in-law, began once more to league againſt Louis with the dukes of Brittany and of Guienne; the latter being the king's brother, formerly duke of Normandy, but who had exchanged that duchy for the territory of Guienne. But while the affairs of the confederates ſeemed to be in a proſperous way, their proſpects were ſuddenly overcaſt by the death of the duke of Guienne, which was univerſally ſuppoſed to have been occaſioned by poiſon, and Louis was as univerſally looked upon as the author. The abbot of St Joan d'Angeli was fixed upon as the immediate perpetrator of the deed: but on the day appointed for his trial he was found ſtrangled in his cell; and this alſo was with great probability ſuppoſed to have been the deed of Louis, who after the death of his brother inſtantly ſeized on the territory of Guienne, and annexed it to the dominions of France.

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112 A treaty between Louis and Charles.

By this unheard of conduct of the French monarch, Charles was exaſperated to ſuch a degree, that he vowed the moſt dreadful vengeance againſt the unhappy people

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people of France, and threatened to ſacrifice to the memory of the duke of Guienne every one who now fell into his hands. The citizens of Neſle were maſſacred without diſtinction of ſex or age; Beauvis reſiſted his attacks; after which Charles wreaked his fury on other places. Having entered the country of Caux, he reduced the cities of Eu and St Valery, burnt Longueville, and waſted the whole country as far as Rouen. Louis, on the other hand, ſteady and conſtant in his deſigns, determined to diſſolve the league between the duke of Brittany and Edward IV. of England. Accordingly he encamped with his army on the frontiers of Brittany; while the duke, not meeting with the aſſiſtance promiſed by Edward, was obliged to conſent to a truce for a year; and the duke of Burgundy himſelf was obliged to follow his example, having committed ſuch devaſtations as deprived him of all means of ſubſiſtence in the country, ſo that he could neither advance nor retreat. In a very little time, however, he again began to conſpire with the king of England againſt Louis, and a powerful invaſion was determined upon. Edward was to croſs the ſea with an army of 10,000 men, while Charles aſſembled all his forces to join him. The former was alſo to ſet up a claim to the crown of France, and at leaſt to obtain the provinces of Normandy and Guienne; the duke was to have Champagne with ſome adjacent diſtricts; to free his dominions from homage; and neither party was to make peace without the conſent of the other. It was ſuppoſed that the duke of Brittany would naturally accede to the confederacy; and the Count de St Pol, conſtable of France, had engaged to deliver up the town of St Quintin and others which he occupied on the river Somme. Louis, however, ſtill had the good fortune to avoid the ſtorm. Charles, inſtead of advancing to the aſſiſtance of Edward, who had entered France at the head of 15,000 archers and 1500 men at arms, laid ſiege to the city of Nuiz on the Rhine; while the conſtable St Pol, inſtead of delivering up the towns as he had promiſed, deceived his allies, and enabled Louis to diſſolve a confederacy, which, had it been vigorouſly maintained, might have involved him in the greateſt difficulties. To procure the departure of Edward, however, he was obliged to conſent to a tribute of 75,000 crowns, as well as to ſettle on the king himſelf 50,000 crowns for life; betrothing alſo the dauphin to the eldeſt daughter of the king of England. The duke of Burgundy exclaimed loudly againſt this treaty; but Edward perſiſted in his reſolution; and it was accordingly executed at a place called *Pecquigny*, near Amiens; but in ſuch a manner as ſhowed the little confidence the two ſovereigns repoſed in each other. A grated barrier was erected in the middle of the bridge of Pecquigny, between the barriers of which only a man's arm could paſs: the two princes appeared on the oppoſite ſides of it; and having conferred privately, and confirmed the treaty between them, parted with many proteſtations of friendſhip; in which, probably, neither party was very ſincere. A power was reſerved by Edward, for the duke of Burgundy to accede to the treaty; but the latter haughtily replied, that he was able to ſupport himſelf without the aſſiſtance of England; and that he would make no peace with Louis till three months after the return of Edward to his own country. To this reſolution he adhered: but no ſooner was the term expired, than he concluded a truce with Louis for nine years. The ſtipulations publicly agreed upon betwixt theſe two princes conſiſted only in ſome articles for the mutual advantage of their ſubjects; but privately they had ſigned others of a different nature. The conſtable St Pol having rendered himſelf obnoxious to all parties by his complicated treachery, fled to Mons in Hainault; but the duke of Burgundy had already conſented to deliver him up on condition of receiving his eſtates and moveables as the price of his treachery.

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113 Furious invaſion of France by Charles of Burgundy.

114 Invaſion by Edward IV. of England.

115 Louis agrees to pay an annual penſion to Edward.

Thus was Louis without any other remarkable qualification than the mere arts of falſehood and duplicity, got rid of all his enemies except the duke of Burgundy, whoſe growing power rendered him a conſtant object of jealouſy and terror. His own imprudence and raſhneſs, however, ſoon proved his ruin. Having raſhly engaged in a war with the Swiſs, he was defeated in the firſt engagement with that martial nation, with the loſs of his military cheſt and baggage, with his plate and jewels, ſuppoſed to be the richeſt in Europe. His diſappointment on this occaſion was ſo great, that he was ſeized with a ſevere ſickneſs, from which he had hardly recovered when he reſumed his mad ſcheme of conquering the Swiſs. Another battle enſued; in which, after an obſtinate diſpute, Charles was defeated with the loſs of 18,000 men, himſelf eſcaping with great difficulty. This diſaſter was followed by the defection of moſt of his allies; the duke of Lorrain recovered the city of Nancy and great part of his dominions which Charles had ſeized; while the latter, overwhelmed with ſhame and diſappointment, ſpent his time in ſolitude and inactivity. From this he was at laſt roufed by the misfortunes which fell upon him in ſuch quick ſucceſſion. He now inveſted the city of Nancy; and in this, as well as in every other inſtance, he acted againſt the advice of his beſt officers; and the conſequences were ſtill more fatal than before. The duke of Lorrain advanced with a ſtrong body of Germans to the relief of the city, while Charles had ſcarcely 4000 men to oppoſe him. His troops were therefore eaſily defeated, and himſelf, notwithſtanding the moſt heroic efforts of valour, hurried away in the crowd. The count de Campobaſſo, an Italian nobleman in whom he put a great deal of confidence, but who was in reality a traitor, had deſerted with about 80 men in the beginning of the engagement. He left 12 or 15 men about the duke's perſon, with ſtrict orders to aſſaſſinate him in the tumult; and this order they punctually complied with; the body of Charles being found two days after the battle pierced with three wounds.

116 Charles engages in a war with the Swiſs.

117 He is aſſaſſinated.

The news of Charles's death was received with the moſt unfeigned joy by Louis, whoſe ſole object now was to unite the territories of the duke of Burgundy to his own. This might be done in two ways; one by a match betwixt the dauphin and Mary the heireſs of Burgundy; the other, by marrying her to the duke of Angouleme, a prince of the royal blood of France, and on whom Mary had ſhewn ſome inclination to beſtow herſelf. The king, however, to whom duplicity and falſehood ſeem to have been abſolutely neceſſary, choſe a third method, more agreeable to his character. The match with the dauphin was attended with ſuch circumſtances

118 Conqueſt of Burgundy by Louis.

France. circumſtances as rendered it evidently impracticable. The diſparity of age was very great, the dauphin being only eight years old, and the princeſs twenty: the Flemings were beſides very much averſe from ſubmitting to a prince whoſe powerful reſources would enable him to oppreſs their liberties: but notwithſtanding theſe unſurmountable difficulties, Louis choſe to inſiſt upon the match, at the ſame time that he endeavoured to make himſelf maſter of her dominions by force of arms. He addreſſed circular letters to the principal cities of Burgundy; repreſenting, that the duchy had been given by King John to the male heirs of his ſon Philip; and that now, when theſe were extinct by the death of Charles, the territory reverted of courſe to the crown. To render this argument more effectual, he corrupted the governors of ſome towns, ſeduced the inhabitants of others to riſe againſt their governors; whilſt he himſelf at the head of an army, prepared to enforce obedience from thoſe who could not be worked upon by other methods. Thus the province of Burgundy was entirely reduced; but Flanders could not be brought under ſubjection either by fair means, force, or fraud. In his conduct for this purpoſe, indeed, Louis diſplayed the moſt deteſtable as well as the meaneſt treachery and falſehood. To render Mary odious to her ſubjects, he negociated with her miniſters, and prevailed upon them to diſcloſe to him ſome of the moſt important ſtate ſecrets; after which he communicated their letters to the ſtates of Flanders. This double treachery, however, did not at preſent anſwer his purpoſe. The two miniſters whom he had betrayed were indeed put to death without mercy, and that even in the preſence of their ſovereign: but Mary herſelf was thus induced to beſtow herſelf upon the emperor Maximilian; and Louis had the mortification to find that all his arts had contributed only to aggrandiſe a rival power, whom he had already ſufficient cauſe to dread. To remedy this overſight, he entered into an alliance with Edward IV. of England, whom he had inſpired with a jealouſy of his brother Clarence, in order to prevent a match betwixt that nobleman and the princeſs Mary, which had alſo been in agitation. Thus a peace was concluded between the two monarchs, to continue during the life of each, and a year after.

The marriage of Mary with Maximilian effectually ſecured the independence of Flanders; while the return of the prince of Orange to the party of that princeſs extended the flames of war once more to the cities of Burgundy. The French were on the point of being totally expelled from that country, when Maximilian unexpectedly made propoſals of peace. A truce was on this concluded between the two princes, but without any term limited for its duration, or without any conditions ſtipulated in favour of the Burgundians; ſo that the whole country was quickly after reduced by Louis.

119 Tyranny and cruelty of Louis.

The king now freed from the apprehenſions of foreign enemies, turned his vindictive diſpoſition againſt his own ſubjects; over whom, under pretence of former rebellions, he exerciſed the moſt inſupportable tyranny. The principal victim to his ſanguinary diſpoſition on this occaſion was James d'Armagnac duke of Nemours, one of the firſt noblemen in the kingdom, but who had formerly appeared a zealous confederate againſt him in the league in which Edward and Charles were concerned. The unfortunate nobleman, knowing that vengeance was determined againſt him, fled to a fortreſs named *Carlat*, ſituated among the mountains of Auvergne. Here he was beſieged by the Seigneur de Beaujeu, who had married Anne the daughter of Louis. The place, however, was almoſt impregnable to any force; ſo that his enemies were obliged to make the moſt ſolemn promiſes of ſafety in order to induce him to ſurrender himſelf. By theſe he was at laſt perſuaded to truſt himſelf in the hands of the faithleſs tyrant; who no ſooner had him in his power than he ſhut him up in the Baſtile in an iron cage, and reprimanded the judges becauſe they had releaſed him from this cloſe confinement during the time of his examination. The judges reluctantly condemned him to be beheaded: but the king's cruelty extended beyond the ſentence; and he ordered the two young ſons of the duke, though yet in early childhood, to be placed directly under the ſcaffold, that they might be covered with the blood of their father. Four thouſand perſons are ſuppoſed to have periſhed upon this occaſion without any form or trial: and were it not for the concurrent teſtimony of the hiſtorians of that age, the inhumanities and barbarities of this monarch are ſcarce to be credited. By theſe he broke the ſpirits of the French nobility, and gradually extended the power of the crown beyond all bounds; ſo that at laſt it was limited only by the ſovereign's pleaſure. Amidſt all the perfidy and cruelty, however, for which this monarch is ſo juſtly to be deteſted, we may on ſome occaſions remark a kind of magnanimity and generoſity, which we cannot but applaud. An inſtance of this was his ſupporting the houſe of Medici againſt Pope Sextus, whom he obliged to deſiſt from his attacks, and to recal his ſentence which he had fulminated againſt them.

France.

120 Burgundy unſucceſsfully invaded by Maximilian.

In 1479, the emperor Maximilian, who had lightly abandoned the duchy of Burgundy when he might have reduced it, now renewed his claims when it was no longer in his power to enforce them. After a variety of actions of leſſer note, and the deſtruction of cities on both ſides, a deciſive battle was fought at Guinegate. Here the Flemings were routed; but as the French purſued with too great ardour, the infantry of the enemy rallied, and the battle was renewed with great ſlaughter on both ſides. A more deciſive advantage was afterwards gained by the capture of 80 Flemiſh veſſels, which induced that commercial people to think of peace. In the mean time, however, Louis, after a life ſpent in continual deceit, hypocriſy, and cruelty, received warning of his approaching end by a fit of apoplexy with which he was ſeized in the year 1480. He lay ſpeechleſs and motionleſs for two days; after which he recovered in ſome degree, but never completely regained his health and ſtrength. His illneſs, however, neither prevented him from purſuing the ſchemes of his ambition, nor from uſing the ſame methods as before to attain them. He ſeized, without any pretence, the eſtates of the duke of Bourbon, the only nobleman in the kingdom whoſe power could give him any cauſe of ſuſpicion; yet, notwithſtanding his aſſiduity for the intereſt of the dauphin, he kept him a kind of priſoner in the caſtle of Amboiſe, permitting none but his own ſervants, or perſons

France.

ſons of the meaneſt rank, to have acceſs to him. He baniſhed his own conſort, the mother of the dauphin, to Savoy, and endeavoured to inſpire the prince with averſion towards her. By the death of Charles, the titular king of Naples, and the laſt of the ſecond houſe of Anjou, he became maſter of the county of Provence; but his ſatisfaction on this occaſion was marred by a ſecond ſtroke of apoplexy. Still, however, he revived, and, with his recovery, again began to purſue his ambitious intrigues. The death of Mary of Burgundy, who periſhed by a fall from her horſe, inſpired him with new views; and he betrothed his ſon to the infant daughter of the emperor. Thus he offended Edward IV. of England, whoſe eldeſt daughter Elizabeth had been previouſly contracted to the dauphin; and a war would have undoubtedly enſued, had it not been for the death of the king of England.

121 Death of Louis XI.

This was followed in no long time after by that of Louis himſelf, who had in vain exhauſted the ſkill of the phyſician, and wearied the clerical order with prayers and proceſſions to avert the impending ſtroke. He expired in the year 1483, after a reign of 23 years; during which he was deteſted by his ſubjects, whom he had continually oppreſſed; and equally dreaded and hated by his neighbours, whom he had conſtantly deceived: notwithſtanding which he obtained the title of *Moſt Chriſtian* from his holineſs, which his ſucceſſors have ever after retained.

Notwithſtanding the dark character of this prince, it is undoubtedly to be allowed, that he laid the foundations of the future greatneſs of France. By his arts he deprived the common people of their liberty, depreſſed the power of the nobility, eſtabliſhed a ſtanding army, and even induced the ſtates to render many taxes perpetual, which formerly were only temporary, in order to ſupport the army which was to keep themſelves in ſlavery. From this time the people were accuſtomed to ſubmit entirely to the voice of their ſovereign as their only legiſlator; and being always obedient in matters of the greateſt conſequence, they cheerfully contributed whatever ſums were required to fulfil the king's pleaſure.

122 Reign of Charles VIII.

Charles VIII. who ſucceeded his father Louis XI. in 1483, was only 14 years of age at the time of his father's death: but though he might, even at that age, have aſcended the throne without any material violation of the laws of France, yet it was judged neceſſary to have a regent, on account of the king's delicacy of conſtitution and want of education. Three competitors appeared as candidates for this important truſt, viz. John duke of Bourbon, a prince of the blood, and who had, till the age of 60, maintained the moſt unblemiſhed character; Louis duke of Orleans, preſumptive heir to the crown, but who from his being only 20 years old himſelf, ſeemed incapacitated on that account from undertaking ſuch an important office: the third competitor was Anne, the eldeſt daughter of Louis, to whom the latter had in the laſt moments of his life committed the charge of the kingdom, with the title of governeſs. The claim of this lady was ſupported by the aſſembly of the ſtates general at Tours; and though ſhe was only entered into the 22d year of her age, it appears that the office could not have been more properly beſtowed. Being married to Peter of Bourbon, ſire of Beaujeu, her preſent title was *the Lady of Beaujeu;* but ſhe appears to have acted entirely independent of her huſband, who was but of a moderate capacity, and indeed had been recommended to her by Louis on account of his ſlender abilities, leſt by any other match the houſe of Bourbon ſhould be too much aggrandized. Her firſt ſtep was to ingratiate herſelf with the people, by ſome popular acts; among which one was to puniſh the inſtruments of her father's cruelties. One of theſe, named Oliver le Dian, who, from the ſtation of a barber, had raiſed himſelf to the confidence and favour of the king, and had diſtinguiſhed himſelf by the invention of new modes of torture, was publicly hanged. Another, named Jean Doyac, who by continual acts of violence and rapacity had oppreſſed the people, was condemned, after being whipped in all the open places or ſquares of Paris, to have one of his ears cut off, and his tongue pierced with a hot iron; after which he was conveyed to his native city of Montferrand, where he was again whipped, and his other ear cut off; after which his eſtates, as well as thoſe of Oliver, were confiſcated. Jacques Coitier, the phyſician of Louis, who had availed himſelf of the terror of death with which the king was ſtrongly influenced, to extort great ſums of money from him, was ordered to anſwer for the immenſe wealth he had acquired; but he averted the danger by paying a fine of 50,000 crowns.

Thus the lady de Beaujeu gained the affection of the people at large; and was equally ſucceſsful in gaining over thoſe who were averſe to her government. The duke of Bourbon was made conſtable, an office which he had long deſired; but the duke of Orleans behaved in ſuch a manner as to exclude all hopes of favour. Incenſed at the determination of a trifling diſpute at tennis againſt him, by the lady Beaujeu, he exclaimed, that whoever had decided in that manner "was a lier if a man, or a ſtrumpet if a woman." After this furious declaration he fled to the caſtle of Beaujency, where, however, he was ſoon forced to ſurrender. He then applied to Henry VII. of England, who had newly aſcended the throne of England; but that prince, naturally ſlow and cautious, did not pay much attention to his propoſals; on which he next made his application to the court of Brittany. Here he was received with great marks of eſteem, and began to entertain hopes of marrying the daughter of the duke; but being looked upon with a jealous eye by the nobility, they entered into ſecret negotiations with Anne, and even ſolicited her to invade the country. In theſe negotiations, however, they ſtipulated that only a certain number of troops ſhould enter the province, and that no fortified place ſhould remain in the hands of the French; which conditions were indeed agreed to by the regent, though ſhe determined to keep them no longer than it anſwered her purpoſe. In purſuance of this reſolution, Brittany was invaded at once by four armies, each of them ſuperior to the ſtipulated number, who quickly made themſelves maſters of the moſt important places in the country; while the troops of the duke retired in diſguſt, leaving them to purſue their conqueſts as they pleaſed. Finding at laſt, however, that the entire ſubjection of their country was determined upon, the nobility began to exert themſelves in defence of it; and, inflamed by the enthuſiaſm of liberty

123 Regency of the Lady Beaujeu.

124 Duke of Orleans flies to Brittany.

125 That country invaded by the French.

ty

France. ty, they raiſed an army of 60,000 men. By theſe the French were compelled to abandon the ſiege of Nantz; but this proved only a tranſient gleam of ſucceſs. Anne perſevered in her deſign of completing the conqueſt of the country, and the ſtate of Europe at that time favoured the deſign. Of all the European ſtates, England alone was then capable of affording any effectual aſſiſtance; and the ſlow caution of Henry prevented him from giving the aſſiſtance which for his own intereſt he ought to have done. Thus the Bretons were left to defend themſelves the beſt way they could; and having ventured a battle, they were entirely defeated, and moſt of their leaders taken priſoners. A ſmall body of Engliſh, under the command of Lord Woodville, who aſſiſted them, were entirely cut in pieces. The duke ſoon after died by a fall from his horſe, leaving his dominions to his daughter Anne, at that time only 13 years of age. A marriage was negotiated betwixt this princeſs and Maximilian king of the Romans, who had been married to Mary of Burgundy; but by reaſon of the poverty of that prince it was never completed. The lady Beaujeu, then finding that the abſolute conqueſt of Brittany would ſtill be a difficult matter, determined to conclude a marriage betwixt the young king of France and the ducheſs, though the former had already been married to Margaret of Auſtria, the daughter of Maximilian. This marriage indeed had not been conſummated by reaſon of the tender age of the princeſs; but ſhe had been ſent to Paris for her education, and had for ſeveral years been treated as queen of France. In 1491, however, Margaret was ſent back to her father: Anne of Brittany for a long time refuſed to violate the engagements into which ſhe had entered; but at laſt, finding herſelf diſtreſſed on all ſides, and incapable of reſiſting the numerous forces of France with which ſhe was preſſed, ſhe reluctantly conſented to the match, and the nuptials were celebrated the ſame year at Langeais in Touraine.

126 Marriage between the king of France and ducheſs of Brittany.

Maximilian, whoſe poverty had prevented him from giving any aſſiſtance to his bride, or even from coming to ſee her, enraged at the double diſgrace he had ſuffered, began, when too late, to think of revenge. France was now threatened with an invaſion from the united forces of Auſtria, Spain, and England. But this formidable confederacy was ſoon diſſipated.—Henry, whoſe natural avarice had prevented him from giving the neceſſary aſſiſtance, was bought off with money: the immediate payment of 745,000 crowns, and the promiſe of 25,000 annually ever after, perſuaded him to retire into his own country. Ferdinand king of Spain had the counties of Rouſſillon and Cerdagne reſtored to him; while Maximilian was gratified by the ceſſion of part of Artois, which had been acquired by Louis XI.

127 His expedition into Italy, and ſurpriſing ſucceſs.

The young king of France agreed to theſe terms the more readily, that he was impatient to undertake an expedition into Italy, in order to conquer the kingdom of Naples, to which he claimed a right. Moſt of his counſellors were againſt the expedition; but the king was inflexible, even though Ferdinand king of Naples offered to do homage for his kingdom, and pay him a tribute of 50,000 crowns a-year. He appointed Peter duke of Bourbon regent in his abſence; after which he ſet out on his expedition with very few troops and very little money. By the way he fell ill of the ſmall-pox, but in a ſhort time recovered, and entering Italy with only 6000 horſe and 12,000 foot, he was attended with the moſt ſurpriſing ſucceſs, traverſing the whole country in ſix weeks, and becoming maſter of the kingdom of Naples in leſs than a fortnight. Such extraordinary good fortune ſeemed miraculous; and he was reckoned an inſtrument raiſed up by God to deſtroy the execrable tyrants with which Italy was at that time infeſted. Had Charles made uſe of this prepoſſeſſion in his favour, and acted up to the character generally given him, he might have raiſed his name as high as any hero of antiquity. His behaviour, however, was of a very different nature. He amuſed himſelf with feaſts and ſhows; and leaving his power in the hands of favourites, they abandoned it to whoever would purchaſe titles, places, or authority, at the rates they impoſed; and the whole force he propoſed to leave in his new conquered dominions amounted to no more than 4000 men. France.

But while Charles was thus loſing his time, a league was concluded againſt him at Venice; into which entered the pope, the emperor Maximilian, the archduke Philip, Ludovic Sforza, and the Venetians. The confederates aſſembled an army of 40,000 men, commanded by Francis marquis of Mantua; and they waited for the king in the valley of Fornova, in the duchy of Parma, into which he deſcended with 9000 men. On the 6th of July 1495 he attacked the allies; and, notwithſtanding their great ſuperiority, defeated them, with the loſs of only 80 of his own men. Thus he got ſafe to France; but his Italian dominions were loſt almoſt as ſoon as he departed. Some ſchemes were propoſed for recovering theſe conqueſts; but they were never put in execution, and the king died of an apoplexy in 1498.

128 His death.

The premature death of this monarch in the 28th year of his age, was ſuppoſed to have been owing to his irregular life, and particularly his attachment to women; which had for ſome time impaired his health, and brought on evident ſymptoms of his approaching diſſolution. At laſt he relinquiſhed his irregularities, and retired with the queen to the caſtle of Ambloiſe. Here in paſſing through a low door he ſtruck his head with violence againſt the top. No unfavourable ſymptom appeared at the time; but ſoon afterwards, as he converſed with his confeſſor, and avowed his deſign of obſerving the nuptial fidelity he owed to the queen, he ſuddenly fell backward in a fit of apoplexy. He recovered his voice three times, and uttered ſome expreſſions of devotion; but inſtantly relapſed, and in a ſhort time expired, notwithſtanding every aſſiſtance that could be given. He was greatly celebrated for his ſweet temper and agreeable diſpoſition, which procured him the ſurnames of the *Affable* and *Courteous*. Two of his domeſtics are ſaid to have died of grief after his death, and his widow abandoned herſelf to the moſt pungent ſorrow for *two days*.

By the death of Charles VIII. the throne of France paſſed from the direct line of the houſe of Valois, and Louis duke of Orleans ſucceeded to the throne. At the time of his acceſſion he was in his 36th year, and had long been taught prudence in the ſchool of adverſity. During the adminiſtration of the lady Beaujeu, he had been, as we have already obſerved, conſtantly in diſgrace; and after his connexions with the

France. duke of Brittany, had ſpent a very conſiderable time in priſon; and though afterwards ſet at liberty by Charles, he had never poſſeſſed any ſhare of that monarch's confidence or favour. Towards the concluſion of that reign, he fell under the diſpleaſure of the queen; and had afterwards continued at his caſtle of Blois till he was called from thence to the poſſeſſion of the kingdom. He had been married in early life, and againſt his will, to Jane the youngeſt daughter of Louis XI. a princeſs of an amiable diſpoſition, but deformed in her perſon, and ſuppoſed to be incapable of bearing children. Afterwards he entertained thoughts of having his marriage diſſolved, and was ſuppoſed to poſſeſs the affection of the ducheſs of Brittany, before ſhe became queen of France. After the death of her huſband, that princeſs retired to Brittany, where ſhe pretended to aſſume an independent ſovereignty; but Louis having got his marriage with Jane diſſolved by Pope Alexander VI. quickly after made propoſals to the queen-dowager, which on her part were accepted without heſitation; though it was ſtipulated, that if ſhe ſhould have two ſons, the younger ſhould inherit the duchy of Brittany.

As Louis, while duke of Orleans, had ſome pretenſions to the kingdom of Naples, he inſtantly ſet about realizing them by conqueſt. On his acceſſion, he found matters in that country much more favourable to his deſigns than formerly. The pope, Alexander VI. was very much in his intereſts, from the hopes of getting his ſon Cæſar Borgia provided for: he had conciliated the friendſhip of the Venetians by promiſing them a part of the Milaneſe; he concluded a truce with the archduke Philip; and renewed his alliances with the crowns of England, Scotland, and Denmark.

129 Expedition of Louis XII. into Italy. He then entered Italy with an army of 20,000 men; and being aſſiſted by the Venetians, quickly conquered one part of the duchy, while they conquered the other, the duke himſelf being obliged to fly with his family to Inſpruck. He then attacked Ferdinand of Spain with three armies at once, two to act by land, and one by ſea; but none of theſe performing any thing remarkable, he was obliged to evacuate the kingdom of Naples in 1504.

In 1506, the people of Genoa revolted; drove out the nobility; choſe eight tribunes; and declared Paul Nuova, a ſilk dyer, their duke: after which they expelled the French governor, and reduced a great part of the Riviera. This occaſioned Louis's return into Italy; where, in 1507, he obliged the Genoeſe to ſurrender at diſcretion: and, in 1508, entered into the league of Cambray, with the other princes who at that time wanted to reduce the overgrown power of the Venetians. Pope Julius II. who had been the firſt contriver of this league, very ſoon repented of it; and declared, that if the Venetians would reſtore the cities of Faenza and Rimini, which had been unjuſtly taken from him, he would be contented. This was refuſed; and in 1509, the forces of the republic received ſuch an entire defeat from Louis, that they agreed to reſtore not only the two cities demanded by Pope Julius, but whatever elſe the allies required.

The pope now, inſtead of executing his treaties with his allies, made war on the king of France without the leaſt provocation. Louis called an aſſembly of his clergy; where it was determined, that in ſome caſes it was lawful to make war upon the pope; upon which France. the king declared war againſt him, and committed the care of his army to the Marſhal de Trivulce. He ſoon obliged the pope to retire into Ravenna; and in 1511, Gaſton de Foix, duke of Nemours, gained a great victory at Ravenna, but was himſelf killed in the engagement. After his death the army was diſbanded for want of pay; and the French affairs in Italy, and everywhere elſe, fell into great confuſion. They recovered the duchy of Milan, and loſt it again in a few weeks. Henry VIII. of England invaded France, and took Terruenne and Tournay; and the Swiſs invaded Burgundy with an army of 25,000 men. In this deſperate ſituation of affairs the queen died, and Louis put an end to the oppoſition of his moſt dangerous enemies by negotiating marriages. To Ferdinand of Spain he offered his ſecond daughter for either of his grandſons, Charles or Ferdinand; and to renounce, in favour of that marriage, his claims on Milan and Genoa. This propoſal was accepted; and Louis himſelf married the princeſs Mary, ſiſter to Henry VIII. of England. This marriage he did not long ſurvive, but died on the 2d of January 1514; and was ſucceeded by Francis I. count of Angouleſme, and duke of Bretagne and Valois.

130 His marriage with the princeſs Mary of England, and death.

131 Francis I. invades Italy.

The new king was no ſooner ſeated on the throne, than he reſolved on an expedition into Italy. In this he was at firſt ſucceſsful, defeating the Swiſs at Marignon, and reducing the duchy of Milan. In 1518, the emperor Maximilian dying, Francis was very ambitious of being his ſucceſſor, and thereby reſtoring to France ſuch a ſplendid title, which had been ſo long loſt. But Maximilian, before his death, had exerted himſelf ſo much in favour of Charles V. of Spain, that Francis found it impoſſible to ſucceed; and from that time an irreconcileable hatred took place between the two monarchs. In 1521, this ill will produced a war; which, however, might perhaps have been terminated, if Francis could have been prevailed upon to reſtore the town of Fontarabia, which had been taken by his admiral Bonivet: but this being refuſed, hoſtilities were renewed with greater vigour than ever; nor were they concluded till France was brought to the very brink of deſtruction. The war was continued with various ſucceſs till the year 1524; when Francis having invaded Italy, and laid ſiege to Pavia, he was utterly defeated before that city, and taken priſoner on the 24th of February.

132 Defeated and taken priſoner.

This diſaſter threw the whole kingdom into the utmoſt confuſion. The Flemiſh troops made continual inroads; many thouſand boors aſſembled in Alſace, in order to make an invaſion from that quarter; Henry VIII. had aſſembled a great army, and threatened the kingdom on that ſide alſo; and a party was formed in the kingdom, in order to diſpoſſeſs the ducheſs of the regency, and confer it upon the duke de Vendoſme. This prince, however, who, after the conſtable, was the head of the houſe of Bourbon, went on purpoſe to Lyons, where he aſſured the regent that he had no view but for her ſervice, and that of his country; upon which he formed a council of the ableſt men of the kingdom, and of this ſhe made him preſident. The famous Andrew Doria failed with the French galleys to take on board the remains of the French troops under the duke of Alva, whom he landed ſafely in France. Thoſe who eſcaped out of the Milaneſe

France. Milaneſe alſo made their way back again as well as they could. Henry VIII. under the influence of Cardinal Wolſey, reſolved not to oppreſs the oppreſſed: he therefore aſſured the regent that ſhe had nothing to fear from him; and at the ſame time adviſed her not to conſent to any treaty by which France was to be diſmembered. To the emperor, however, he uſed another language. He told him, that the time was now come when this puiſſant monarchy lay at their mercy; and therefore, that ſo favourable an opportunity ſhould not be let ſlip: that, for his part, he ſhould be content with Normandy, Guienne, and Gaſcony, and hoped the empire would make no ſcruple of owning him king of France: adding, that he expected the emperor would make a right uſe of his victory, by entering Guienne in perſon; in which caſe he was ready to bear half the expences of the war. He foreſaw what fell out: the emperor was alarmed at theſe conditions, and did not care to have him for a neighbour; for which reaſon he agreed to a truce with the regent for ſix months. In Picardy the Flemings were repulſed; and the count de Guiſe, with the duke of Lorrain, had the good fortune, with a handful of troops, to defeat and cut to pieces the German peaſants.

133 Francis I. carried to Madrid, where he ſigns a diſadvantageous treaty; In the mean time, Francis was detained in captivity in Italy: but being wearied of his confinement in that country, and the princes of Italy beginning to cabal for his deliverance, he was carried to Madrid; where, on the 14th of January 1525, he ſigned a treaty, the principal articles of which were, That he ſhould reſign to the emperor the duchy of Burgundy in full ſovereignty; that he ſhould deſiſt from the homage which the emperor owed him for Artois and Flanders; that he ſhould renounce all claim to Naples, Milan, Aſti, Tournay, Liſle, and Heſden, &c.; that he ſhould perſuade Henry d'Albert to reſign the kingdom of Navarre to the emperor, or at leaſt ſhould give him no aſſiſtance; that within 40 days he ſhould reſtore the duke of Bourbon and all his party to their eſtates; that he ſhould pay the king of England 500,000 crowns which the emperor owed him; that when the emperor went to Italy to receive the Imperial crown, he ſhould lend him 12 galleys, four large ſhips, and a land army, or inſtead of it 200,000 crowns.

All theſe articles the king of France promiſed on the word and honour of a prince to execute; or, in caſe of non-performance to return priſoner into Spain. But, notwithſtanding theſe profeſſions, Francis had already proteſted before certain notaries and witneſſes in whom he could truſt, that the treaty he was about to ſign was againſt his will, and therefore null and void. On the 21ſt of February, the emperor thought fit to releaſe him from his priſon, in which he had been cloſely confined ever ſince his arrival in Spain; and after receiving the ſtrongeſt aſſurances from his own mouth, that he would literally fulfil the terms of the treaty, ſent him under a ſtrong guard to the frontiers, where he was exchanged for his two eldeſt ſons, who were to remain as hoſtages for his fidelity.

134 and breaks it. When the king returned to his dominions, his firſt care was to get himſelf abſolved by the pope from the oaths he had taken; after which he entered into a league with the pontiff, the Venetians, the duke of Milan, and the king of England, for preſerving the peace of Italy. In the month of June, he publicly received remonſtrances from the ſtates of Burgundy; in which they told him, without ceremony, that by the treaty of Madrid he had done what he had no right to do, in breach of the laws and his coronation oath; adding, that if he perſiſted in his reſolution of throwing them under a foreign yoke, they muſt appeal to the general ſtates of the kingdom. At theſe remonſtrances the viceroy of Naples and the Spaniſh miniſters were preſent. They perceived the end which the king aimed at, and therefore expoſtulated with him in pretty warm terms. At laſt the viceroy told him, that he had now nothing left but to keep his royal word in returning to the caſtle of Madrid, as his predeceſſor John had done in a like caſe. To this the king replied, that King John acted rightly; that he returned to a king who had treated him like a king; but that at Madrid he had received ſuch uſage as would have been unbecoming to a gentleman: that he had often delared to the emperor's miniſters, that the terms they extorted from him were unjuſt and impracticable: but that he was ſtill willing to do all that was fit and reaſonable; and to ranſom his ſons at the rate of two millions of gold, in lieu of the duchy of Burgundy. France.

Hitherto the treaty for the tranquillity of Italy had been kept ſecret, in hopes that ſome mitigation of the treaty of Madrid would have been obtained; but now it was judged expedient to publiſh it, though the viceroy of Naples and the Spaniſh lords were ſtill at the French court; and the emperor was to be admitted into it, provided he accepted the king's offer of two millions for the releaſe of his children, and left the duke of Milan and other Italian princes in quiet poſſeſſion of their dominions. It is the common misfortune of all leagues, that the powers who enter into them keep only their own particular intereſts in view, and thus defeat the general intention of the confederacy. This was the caſe here. The king's great point was to obtain his children upon the terms he had propoſed; and he was deſirous of knowing what hopes there were of that, before he acted againſt the monarch who had them in his power. Thus the duke of Milan and the pope were both ſacrificed. The former was obliged to ſurrender to the duke of Bourbon, and the latter was ſurpriſed by the Colonnas; both of which diſaſters would have been prevented if the French ſuccours had entered Italy in time. See ITALY.

According to an agreement which had been made between Francis and Henry, their ambaſſadors went into Spain, attended each of them by a herald, in order to ſummon the emperor to accept the terms which had been offered him; or, in caſe of refuſal, to declare war. It ſeems the emperor's anſwer was foreſeen in the court of France; and therefore the king had previouſly called together an aſſembly of the notables; that is, perſons of the ſeveral ranks of his people in whom he could confide. To them he propoſed the great queſtion, Whether he was bound to perform the treaty of Madrid? or, Whether if he did not perform it, he was obliged in honour to return to Spain? To both theſe queſtions, the aſſembly anſwered in the negative: they ſaid, that Burgundy was united to the crown of France, and that he could not ſeparate it by his own authority; that his perſon alſo was the property of the public, of which therefore he could not diſpoſe; but for the two millions, which they looked

France. upon as a juſt equivalent, they undertook that it ſhould be raiſed for his ſervice. When the ambaſſadors delivered their propoſitions, Charles treated the Engliſh herald with reſpect, and the French one with contempt; which produced a challenge from Francis to the emperor †. All differences, however, were at laſt adjuſted; and a treaty was concluded at Cambray, on the 5th of Auguſt 1528. By this treaty, inſtead of the poſſeſſion, the emperor contented himſelf with reſerving his right to the duchy of Burgundy, and the two millions of crowns already mentioned. Of theſe he was to receive 1,200,000 in ready money: the prince's lands in Flanders belonging to the houſe of Bourbon were to be delivered up; theſe were valued at 400,000 more: and the remaining 400,000 were to be paid by France in diſcharge of the emperor's debt to England. Francis was likewiſe to diſcharge the penalty of 500,000 crowns which the emperor had incurred, by not marrying his niece the princeſs Mary of England; and to releaſe a rich *fleur-de-lis* which had been many years before pawned by the houſe of Burgundy for 50,000 crowns. The town and caſtle of Heſden were alſo yielded; together with the ſovereignty of Flanders and Artois, and all the king's pretenſions in Italy. As for the allies of France, they were abandoned to the emperor's mercy, without the leaſt ſtipulation in their favour; and Francis himſelf proteſted againſt the validity of the treaty before he ratified it, as did alſo his attorney-general before he regiſtered it in parliament; but both of them with the greateſt ſecrecy imaginable.

† See *Duel.*

135 Treaty of Cambray.

Nothing farther of much conſequence happened during the remainder of the reign of Francis I. The war was ſoon renewed with Charles, who made an invaſion into France, but with very bad ſucceſs; nor was peace fully eſtabliſhed but by the death of Francis, which happened on the 3d of March, 1547. He was ſucceeded by his ſon Henry II. who aſcended the throne that very day on which he was 29 years of age. In the beginning of his reign, an inſurrection happened in Guienne, owing to the oppreſſive conduct of the officers who levied the ſalt tax. The king deſpatched againſt the inſurgents two bodies of troops; one commanded by the duke of Aumale ſon to the duke of Guiſe, the other by the conſtable. The firſt behaved with the greateſt moderation, and brought back the people to their duty without making many examples: the other behaved with the utmoſt haughtineſs and cruelty; and though the king afterwards remitted many of his puniſhments, yet from that time the conſtable became odious to the people, while the family of Guiſe were highly reſpected.

136 Francis dies and is ſucceeded by Henry II.

137 Henry perſecutes the Proteſtants.

In 1548, the king began to execute the edicts which had been made againſt the Proteſtants with the utmoſt ſeverity; and, thinking even the clergy too mild in the proſecution of hereſy, erected for that purpoſe a chamber compoſed of members of the parliament of Paris. At the queen's coronation, which happened this year, he cauſed a number of Proteſtants to be burned, and was himſelf preſent at the ſpectacle. He was, however, ſo much ſhocked, that he could never forget it; but complained, as long as he lived, that, at certain times, it appeared before his eyes, and troubled his underſtanding.

In 1549, a peace being concluded with England, the king purchaſed Boulogne from the latter, for the ſum of 400,000 crowns; one half to be paid on the day of reſtitution, and the other a few months after. Scotland was included in the treaty, and the Engliſh reſtored ſome places they had taken there. This was the moſt advantageous peace that France had hitherto made with England; the vaſt arrears which were due to that crown being in effect remitted; and the penſion which looked ſo like tribute, not being mentioned, was in fact extinguiſhed. The earl of Warwick himſelf, who had concluded the peace, was ſo ſenſible of the diſgrace ſuffered by this nation on this occaſion, that he pretended to be ſick, in order to avoid ſetting his hand to ſuch a ſcandalous bargain.

France. 138 Advantageous treaty with England.

This year, an edict was made to reſtrain the extravagant remittances which the clergy had been in uſe of making to the court of Rome, and for correcting ſome other abuſes committed by the papal notaries. With this edict Pope Julius III. was highly diſpleaſed; and the following year (1550) war was declared by the king of France againſt the pope and the emperor. The pretence was, that Henry protected Octavio Farneſe duke of Parma, whom the pope was deſirous of depriving of his dominions. In this war the king was threatened with the cenſures of the church, more eſpecially when it was known that he had entered into an alliance with the Turks, and a Turkiſh fleet entered the Mediterranean, where they threatened the iſle of Gozo, and made deſcents upon Sicily. Henry, however, ſtrongly denied any ſuch connexion, and inſiſted that the emperor had given them ſufficient provocation: but be that as it will, the emperor ſoon found himſelf in ſuch danger from theſe new enemies, that he could not ſupport the pope as he intended, who on that account was obliged to ſue for peace. After this the king continued the war againſt the emperor with ſucceſs; reducing the cities of Toul, Verdun, and Metz. He then entered the country of Alſace, and reduced all the fortreſſes between Hagenau and Wiſſenburg. He failed, however, in his attempt on Straſburg; and was ſoon after obliged by the German princes and the Swiſs to deſiſt from farther conqueſts on that ſide. This war continued with very little interruption, and as little ſucceſs on the part of the French, till the year 1557, when a peace was concluded; and ſoon after, the king was killed at a tournament by one Count de Montgomery, who was reckoned one of the ſtrongeſt knights in France, and who had done all he could to avoid this encounter with the king.

139 Henry's ſucceſs againſt the emperor.

140 He is killed at a tournament.

The reign of his ſucceſſor Francis II. was remarkable only for the perſecution of the Proteſtants; which became ſo grievous, that they were obliged to take up arms in their own defence. This occaſioned ſeveral civil wars, the firſt of which commenced in the reign of Charles IX. who ſucceeded to the throne in 1560. This firſt war continued till the year 1562, when a peace was concluded, by which the Proteſtants were to have a free pardon and liberty of conſcience. In 1565, the war broke out anew, and was continued with very little interruption till 1569, when peace was again concluded upon very advantageous terms for the Proteſtants. After this King Charles, who had now taken the government into his hands careſſed the Proteſtants in an extraordinary manner. He invited to court

141 Civil wars with the Proteſtants.

France. court the admiral Coligni, who was the head of the Proteſtant party; and cajoled him ſo, that he was lulled into a perfect ſecurity, notwithſtanding the many warnings given him by his friends, that the king's fair ſpeeches were by no means to be truſted; but he had ſoon reaſon to repent his confidence. On the 22d of Auguſt 1571, as he was walking from the court to his lodgings, he received a ſhot from a window, which carried away the ſecond finger of his right hand, and wounded him grievouſly in the left arm. This he himſelf aſcribed to the malice of the duke of Guiſe, the head of the Catholic party. After dinner, however, the king went to pay him a viſit, and amongſt others made him this compliment: "You have received the wound, but it is I who ſuffer;" deſiring at the ſame time that he would order his friends to quarter about his houſe, and promiſing to hinder the Catholics from entering that quarter after it was dark. This ſatisfied the admiral of the king's ſincerity; and hindered him from complying with the deſires of his friends, who would have carried him away, and who were ſtrong enough to have forced a paſſage out of Paris if they had attempted it.

142 Dreadful maſſacre of the Proteſtants.

In the evening, the queen mother, Catharine de Medicis, held a cabinet council to fix the execution of the maſſacre of the Proteſtants, which had been long meditated. The perſons of which this council was compoſed, were, Henry duke of Anjou, the king's brother; Gonzagua duke of Nevers; Henry of Angouleſme grand prior of France, and baſtard brother of the king; and marſhal de Tavannes; and Albert de Gondi, count de Retz: the direction of the whole was given to the duke of Guiſe, to whom the adminiſtration had been entirely confided during the former reign. The guards were appointed to be in arms, and the city officers were to diſpoſe the militia to execute the king's orders, of which the ſignal was the ringing of a bell near the Louvre. Some ſay, that when the hour approached, which was that of midnight, the king grew undetermined: that he expreſſed his horror at ſhedding ſo much blood, eſpecially conſidering that the people whom he was going to deſtroy were his ſubjects, who had come to the capital at his command, and in confidence of his word; and particularly the admiral, whom he had detained ſo lately by his careſſes. The queen mother, however, reproached him with his cowardice, and repreſented to him the great danger he was in from the Proteſtants; which at laſt induced him to conſent. According to others, however, the king himſelf urged on the maſſacre; and when it was propoſed to him to take off only a few of the heads, he cried out, "If any are to die, let there not be one left to reproach me with breach of faith."

As ſoon as the ſignal was given, a body of Swiſs troops of the Catholic religion, headed by the duke of Guiſe, the chevalier d'Angouleſme, accompanied by many perſons of quality, attacked the admiral's houſe. Having forced open the doors, the foremoſt of the aſſaſſins ruſhed into the apartment; and one of them aſked if he was Coligni? To this he anſwered that he was; adding, "Young man reſpect theſe gray hairs:" to which the aſſaſſin replied by running him through the body with a ſword. The duke of Guiſe and the chevalier growing impatient below ſtairs, cried out to know if the buſineſs was done; and being told that it was, commanded that the body ſhould be thrown out at the window. As ſoon as it fell on the ground, the chevalier, or (as ſome ſay) the duke of Guiſe, wiping the blood off the face, kicked it with his foot. The body was then abandoned to the fury of the populace; who, after a ſeries of indignities, dragged it to the common gallows, to which they chained it by the foot, the head being cut off and carried to the queen mother; who, it is ſaid, cauſed it to be embalmed and ſent to Rome. The king himſelf went to ſee the body hang upon the gibbet; where a fire being kindled under it, part was burnt, and the reſt ſcorched. In the Louvre, the gentlemen belonging to the king of Navarre and the prince of Condé were murdered under the king's eye. Two of them, wounded and purſued by the aſſaſſins, fled into the bedchamber of the queen of Navarre and jumped upon her bed, beſeeching her to ſave their lives; and as ſhe went to aſk this favour of the queen mother, two more, under the like circumſtances ruſhed into the room, and threw themſelves at her feet. The queen mother came to the window to enjoy theſe dreadful ſcenes; and the king, ſeeing the Proteſtants who lodged on the other ſide of the river flying for their lives, called for his long gun, and fired upon them. In the ſpace of three or four days, many thouſands were deſtroyed in the city of Paris, by the moſt cruel deaths which malice itſelf could invent. Peter Ramus, profeſſor of philoſophy and mathematics, after being robbed of all he had, his belly being firſt ripped open, was thrown out of a window. This ſo much affected Denis Lambin, the king's profeſſor, that, though a zealous Catholic, he died of terror. The firſt two days, the king denied it was done by his orders, and threw the whole blame on the houſe of Guiſe: but, on the 28th of Auguſt, he went to the parliament, avowed it, was complimented upon it, and directed a proceſs againſt the admiral, by which he was ſtigmatized as a traitor. Two innocent gentlemen ſuffered as his accomplices in a pretended plot againſt the life of the king, in order to ſet the crown on the head of the prince of Condé. They were executed by torch light; and the king and the queen mother (with the king of Navarre and the prince of Condé by force) were ſpectators of this horrid deed; and they alſo aſſiſted at the jubilee to thank God for the execution of ſuch an infamous deſign.

France.

The maſſacre was not confined to the city of Paris alone. On the eve of St Bartholomew, orders had been ſent to the governors of provinces to fall upon the Proteſtants themſelves, and to let looſe the people upon them; and though an edict was publiſhed before the end of the week, aſſuring them of the king's protection, and that he by no means deſigned to exterminate them becauſe of their religion, yet private orders were ſent, of a nature directly contrary; in conſequence of which, the maſſacre, or (as, in alluſion to the Sicilian veſpers†, it is now ſtyled) the *Matins of Paris*, were repeated in Meaux, Orleans, Troyes, Angers, Thouloufe, Rouen, and Lyons; ſo that in the ſpace of two months 30,000 Proteſtants were butchered. The next year Rochelle, the only ſtrong fortreſs which the Proteſtants held in France, was beſieged, but was not taken without the loſs of 24,000 of the Catholics who beſieged it. After this a pacification enſued on terms

† See *Sicily*.

favourable

France. favourable to the Proteſtants, but to which they never truſted.

This year the duke of Anjou was elected king of Poland, and ſoon after ſet out to take poſſeſſion of his new kingdom. The king accompanied him to the frontiers of the kingdom; but during the journey was ſeized with a ſlow fever, which from the beginning had
143 Death of Charles IX. a very dangerous appearance. He lingered for ſome time under the moſt terrible agonies both of body and mind; and at laſt died on the 30th of May 1572, having lived 24 years, and reigned 13. It is ſaid, that after the dreadful maſſacre above mentioned, this prince had a fierceneſs in his looks, and a colour in his cheeks, which he never had before. He ſlept little, and never ſound. He waked frequently in agonies, and had ſoft muſic to compoſe him again to reſt.

144 Henry III. During the firſt years of the reign of Henry III. who ſucceeded his brother Charles, the war with the Proteſtants was carried on with indifferent ſucceſs on the part of the Catholics. In 1575, a peace was concluded, called by way of eminence the *Edict of Pacification*. It conſiſted of no fewer than 63 articles; the ſubſtance of which was, that liberty of conſcience, and the public exerciſe of religion, were granted to the reformed, without any other reſtriction than that they ſhould not preach within two leagues of Paris or any other part where the court was; party chambers erected in every parliament, to conſiſt of equal numbers of Catholics and Proteſtants, before whom all judgments were to be tried: The judgments againſt the admiral, and, in general, all who had fallen in the war or been executed, were reverſed; and eight cautionary towns were given to the Proteſtants.

145 Catholic league formed. The edict gave occaſion to the Guiſes to form an aſſociation in defence, as was pretended, of the Catholic religion, afterwards known by the name of the *Catholic League*. In this league, though the king was mentioned with reſpect, he could not help ſeeing that it ſtruck at the very root of his authority: for, as the Proteſtants had already their chiefs, ſo the Catholics were, for the future, to depend entirely upon the chief of the league; and were, by the very words of it, to execute whatever he commanded, for the good of the cauſe, againſt any, without exception of perſons. The king, to avoid the bad effects of this, by the advice of his council declared himſelf head of the league; and of conſequence recommenced the war againſt the Proteſtants, which was not extinguiſhed as long as he lived.

The faction of the duke of Guiſe, in the mean time, took a reſolution of ſupporting Charles cardinal of Bourbon, a weak old man, as preſumptive heir of the crown. In 1584 they entered into a league with Spain, and took up arms againſt the king; and though peace was concluded the ſame year, yet in 1587 they again proceeded to ſuch extremities, that the king was forced to fly from Paris. Another reconciliation was ſoon after effected; but it is generally believed that the king from this time reſolved on the deſtruction of Guiſe. Accordingly, finding that this nobleman ſtill behaved towards him with his uſual inſolence, the king cauſed him to be ſtabbed, as he was coming into his preſence, by his guards, on the 23d of December 1587. The king himſelf did not long ſurvive him; being ſtabbed by one James Clement, a Jacobine monk, on the firſt of Auguſt 1588. His wound at firſt was not thought mortal; but his frequent ſwooning quickly diſcovered his danger; and he died next morning, in the 39th year of his age, and 16th of his reign. France.

146 Duke of Guiſe murdered, and likewiſe the king.

147 Henry IV. Before the king's death, he nominated Henry Bourbon king of Navarre for his ſucceſſor on the throne of France; but as he was a Proteſtant, or at leaſt one who greatly favoured their cauſe, he was at firſt owned by very few except thoſe of the Proteſtant party. He met with the moſt violent oppoſition from the members of the Catholic league; and was often reduced to ſuch ſtraits, that he went to people's houſes under colour of viſits, when in reality he had not a dinner in his own. By his activity and perſeverance, however, he was at laſt acknowledged throughout the whole kingdom, to which his abjuration of the Proteſtant religion contributed not a little. As the king of Spain had laid claim to the crown of France, Henry no ſooner found himſelf in a fair way of being firmly ſeated on the throne, than he formally declared war againſt that kingdom; in which he at laſt proved ſucceſsful, and in 1597 entered upon the quiet poſſeſſion of his kingdom.

The king's firſt care was to put an end to the religious diſputes which had ſo long diſtracted the kingdom. For this purpoſe, he granted the famous
148 Edict of Nantz. edict, dated at Nantz, April 13. 1598. It re-eſtabliſhed, in a moſt ſolid and effectual manner, all the favours that had ever been granted to the reformed by other princes; adding ſome which had not been thought of before, particularly the allowing them a free admiſſion to all employments of truſt, profit, and honour; the eſtabliſhing chambers in which the members of the two religions were equal; and the permitting their children to be educated without conſtraint in any of the univerſities. Soon after, he concluded peace with Spain upon very advantageous terms. This gave him an opportunity of reſtoring order and juſtice throughout his dominions; of repairing all the ravages occaſioned by the civil war; and aboliſhing all thoſe innovations which had been made, either to the prejudice of the prerogatives of the crown or the welfare of the people. His ſchemes
149 The king propoſes to new-model the European powers. of reformation, indeed, he intended to have carried beyond the boundaries of France. If we may believe the duke of Sully, he had in view no leſs a deſign than the new-modelling of all Europe. He imagined that the European powers might be formed into a kind of Chriſtian republic, by rendering them as nearly as poſſible of equal ſtrength; and that this republic might be maintained in perpetual peace, by bringing all their differences to be decided before a ſenate of wiſe, diſintereſted, and able judges: and then he thought it would be no difficult matter to overturn the Ottoman empire. The number of theſe powers was to be 15; viz. the Papacy; the empire of Germany; France; Spain; Hungary; Great Britain; Bohemia; Lombardy; Poland; Sweden; Denmark; the republic of Venice; the States General; the Swiſs Cantons; and the Italian commonwealth, which was to comprehend the ſtates of Florence, Genoa, Lucca, Modena, Parma, Mantua, and Monaco. In order to render the ſtates equal, the empire was to be given to the duke of Bavaria; the kingdom of Naples to the pope; that of Sicily

France. Sicily to the Venetians; Milan to the duke of Savoy, who, by his acquiſition, was to become king of Lombardy; the Auſtrian Low Countries were to be added to the Dutch republic; Franche Compte, Alſace, and the country of Trent, were to be given to the Swiſs. With a view, it is now thought, of executing this grand project, but under pretence of reducing the exorbitant power of the houſe of Auſtria, Henry made immenſe preparations both by ſea and land; but if he really had ſuch a deſign, he was prevented by death from attempting to execute it. He was ſtabbed in his coach by one Ravilliac, on the 12th of May 1608.

150 He is murdered.

On the death of Henry IV. the queen mother aſſumed the regency. Ravilliac was executed, after ſuffering horrid tortures. It is ſaid that he made a confeſſion, which was ſo written by the perſon who took it down, that not one word of it could ever be read, and thus his inſtigators and accomplices could never be diſcovered. The regency, during the minority of Louis XIII. was only remarkable for cabals and intrigues of the courtiers. In 1617, the king aſſumed the government himſelf, baniſhed the queen mother to Blois, cauſed her favourite Marſhal d'Ancre to be killed, and choſe for his miniſter the famous Cardinal Richelieu. In 1620, a new war broke out between the Catholics and Proteſtants which was carried on with the greateſt fury on both ſides; and we may judge of the ſpirit which actuated both parties by what happened at Negrepliſſe, a town in Quercy. This place was beſieged by the king's troops, and it was reſolved to make an example of the inhabitants. The latter, however, abſolutely refuſed to ſurrender upon any terms. They defended themſelves, therefore, moſt deſperately; and the city being at laſt taken by ſtorm, they were all maſſacred, without reſpect of rank, ſex, or age, except ten men. When theſe were brought into the king's preſence, he told them they did not deſerve mercy: they anſwered, that they would not receive it; that the only favour they aſked, was to be hanged on trees in their own gardens; which was granted, and the place reduced to aſhes. Both parties ſoon became weary of ſuch a deſtructive war; and a peace was concluded in 1621, by which the edict of Nantz was confirmed. This treaty, however, was of no long duration. A new war broke out which laſted till the year 1628, when the edict of Nantz was again confirmed; only the Proteſtants were deprived of all their cautionary towns, and conſequently of the power of defending themſelves in time to come. This put an end to the civil wars on account of religion in France. Hiſtorians ſay, that in theſe wars above a million of men loſt their lives, that 150,000,000 livres were ſpent in carrying them on; and that 9 cities, 400 villages, 2000 churches, 2000 monaſteries, and 10,000 houſes, were burnt or otherwiſe deſtroyed during their continuance. The next year, the king was attacked with a ſlow fever which nothing could allay, an extreme depreſſion of ſpirits, and prodigious ſwelling in his ſtomach and belly. The year after, however, he recovered, to the great diſappointment of his mother, who had been in hopes of regaining her power. She was arreſted; but found means to eſcape into Flanders, where ſhe remained during the reſt of his reign. Richelieu, by a maſterly train of politics, though himſelf was next to an enthuſiaſt for popery, ſupported the Proteſtants of Germany and Guſtavus Adolphus againſt the houſe of Auſtria; and after quelling all the rebellions and conſpiracies which had been formed againſt him in France, he died ſome months before Louis XIII. in 1643.

151 Louis XIII.

France.

Louis XIV. ſurnamed *le Grand*, ſucceeded to the throne when he was only five years of age. During his minority, the kingdom was torn in pieces under the adminiſtration of his mother Anne of Auſtria, by the factions of the great, and the diviſions between the court and parliament, for the moſt trifling cauſes and upon the moſt deſpicable principles. The prince of Condé flamed like a blazing ſtar; ſometimes a patriot, ſometimes a courtier, and ſometimes a rebel. He was oppoſed by the celebrated Turenne, who from a Proteſtant had turned Papiſt. The nation of France was involved at once in civil and domeſtic wars; but the queen mother having made choice of Cardinal Mazarine for her firſt miniſter, he found means to turn the arms even of Cromwell againſt the Spaniards, and to divide the domeſtic enemies of the court ſo effectually among themſelves, that when Louis aſſumed the reins of government into his own hands, he found himſelf the moſt abſolute monarch that had ever ſat upon the throne of France. He had the good fortune, on the death of Mazarine, to put the domeſtic adminiſtration of his affairs into the hands of Colbert, who formed new ſyſtems for the glory, commerce, and manufactures of France, all which he carried to a ſurpriſing height. The king himſelf ignorant and vain, was blind to every patriotic duty of a king, promoting the intereſts of his ſubjects only that they might the better anſwer the purpoſes of his greatneſs; and by his ambition he embroiled himſelf with all his neighbours, and wantonly rendered Germany a diſmal ſcene of deveſtation. By his impolitic and unjuſt revocation of the edict of Nantz in the year 1685, with the dragooning * the Proteſtants that followed it, he obliged them to take ſhelter in England, Holland, and different parts of Germany, where they eſtabliſhed the ſilk manufactories, to the great prejudice of their own country. He was ſo blinded by flattery, that he arrogated to himſelf the divine honours paid to the Pagan emperors of Rome. He made and broke treaties for his conveniency: and in the end he raiſed againſt himſelf a confederacy of almoſt all the other princes of Europe; at the head of which was King William III. of England. He was ſo well ſerved, that he made head for ſome years againſt this alliance; and France ſeemed to have attained the higheſt pitch of military glory, under the conduct of thoſe renowned generals Condé and Turenne. (See UNITED PROVINCES). At length, having provoked the Engliſh by his repeated infidelities, their arms under the duke of Marlborough, and thoſe of the Auſtrians under Prince Eugene, rendered the latter part of Louis's life as miſerable as the beginning of it was ſplendid. His reign, from the year 1702 to 1711, was one continued ſeries of defeats and calamities; and he had the mortification of ſeeing thoſe places taking from him, which, in the former part of his reign, were acquired at the expence of many thouſand lives. (See BRITAIN, N° 342, &c.)—Juſt as he was reduced, old as he was, to the deſperate reſolution of collecting his people and dying at their head, he was ſaved by the Engliſh Tory miniſtry deſerting

152 Louis XIV.

* See *Dragooning*.

France

ſerting the cauſe, withdrawing from their allies, and concluding the peace of Utrecht in 1713. See BRITAIN, N° 371, &c.

The laſt year of Louis XIV. were alſo embittered by domeſtic calamities; which, added to thoſe he had already endured of a public nature, impreſſed him with a deep melancholy. He had been for ſome time afflicted with a fiſtula; which, though ſucceſsfully cut, ever afterwards affected his health. The year before the peace, his only ſon, the duke of Burgundy, died, together with the duchefs and their eldeſt ſon; and the only remaining child was left at the point of death. The king himſelf ſurvived till the month of September 1715; but on the 14th of that month expired, leaving the kingdom to his great grandſon Louis, then a minor.

153 Louis XV.

154 Adminiſtration of the duke of Orleans.

By the laſt will of Louis he had devolved the regency during the minority of the young king, upon a council, at the head of which was the duke of Orleans. That nobleman, however, diſguſted with a diſpoſition which gave him only a caſting vote, appealed to the parliament of Paris, who ſet aſide the will of the late king and declared him ſole regent. His firſt acts were extremely popular, and gave the moſt favourable ideas of his government and character. He reſtored to the parliament the right which had been taken from them of remonſtrating againſt the edicts of the crown, and compelled thoſe who had enriched themſelves during the calamities of the former reign to reſtore their wealth. He alſo took every method to efface the calamities occaſioned by the unſucceſsful wars in which his predeceſſor had engaged; promoted commerce and agriculture; and, by a cloſe alliance with Great Britain and the United Provinces, ſeemed to lay the foundation of a laſting tranquillity. This happy proſpect, however, was ſoon overcaſt by the intrigues of Alberoni the Spaniſh miniſter, who had formed a deſign of recovering Sardinia from the emperor, Sicily from the duke of Savoy, and of eſtabliſhing the Pretender on the throne of Britain. To accompliſh theſe purpoſes, he negotiated with the Ottoman Porte, Peter the Great of Ruſſia, and Charles XII. of Sweden; the Turks intending to reſume the war againſt the emperor; the two latter to invade Great Britain. But as long as the duke of Orleans retained the adminiſtration of France, he found it impoſſible to bring his ſchemes to bear. To remove him, therefore, he fomented diviſions in the kingdom. An inſurrection took place in Brittany; and Alberoni ſent ſmall parties into the country in diſguiſe, in order to ſupport the inſurgents, and even laid plots to ſeize the regent himſelf. All of a ſudden, however, the Spaniſh miniſter found himſelf diſappointed in every one of his ſchemes. His partizans in France were put to death; the king of Sweden was killed at Frederickſhall in Norway; the Czar, intent on making new regulations, could not be perſuaded to make war upon Britain; and the Turks refuſed to engage in a war with the emperor, from whom they had lately ſuffered ſo much. The cardinal, nevertheleſs, continued his intrigues; which quickly produced a war betwixt Spain on the one part, and France and Britain on the other. The Spaniards, unable to reſiſt the union of two ſuch formidable powers, were ſoon reduced to the neceſſity of ſuing for peace; and the terms were dictated by the regent of France; and of theſe the diſmiſſion of Alberoni the Spaniſh miniſter was one. A double marriage was now ſet on foot: the duke of Orleans gave his own daughter, Mademoiſelle Montpenſier, to Don Lewis prince of Aſturias, while the infanta of Spain was betrothed to her couſin the king of France. From this time the houſe of Bourbon continued united; both princes being convinced, that it was their intereſt not to waſte their ſtrength in wars againſt each other.

France.

155 Deſtructive project of John Law.

The ſpirit of conqueſt having now in a great meaſure ſubſided, and that of commerce take place throughout the world in general, France became the ſcene of as remarkable a project in the commercial way as ever was known in any country. One John Law, a Scotſman, who had been obliged to leave his own country, laid the plan of a company which might by its notes pay off the debt of the nation, and reimburſe itſelf by the profits. Law had wandered through various parts of Europe, and had ſucceſſively endeavoured to engroſs the attention of various courts. The propoſal was made to Victor Amadeus king of Sicily; but he diſmiſſed Law with a reply, that "he was not rich enough to ruin himſelf:" but in France it was looked upon in a more favourable light; the nation being at this time involved in a debt of 200 millions, and the regent, as well as the people in general, very fond of embarking in new ſchemes. The bank, thus eſtabliſhed, proceeded at firſt with ſome degree of caution; but having by degrees extended their credit to more than 80 times their real ſtock, they ſoon became unable to anſwer the demands made upon them; ſo that the company was diſſolved the very ſame year in which it had been inſtituted. The confuſion into which the kingdom was thrown by this fatal ſcheme, required the utmoſt exertions of the regent to put a ſtop to it; and ſcarcely was this accompliſhed when the king, in 1723, took the government into his own hands. The duke then became miniſter; but did not long enjoy this poſt. His irregularities had broken his conſtitution, and had brought on a number of maladies, under which he in a ſhort time ſunk, and was ſucceeded in his adminiſtration by the duke of Bourbon Condé. The king, as we have already remarked, had been married, when very young, to the infanta of Spain, though by reaſon of his tender years the marriage had never been completed. The princeſs, however, had been brought to Paris, and for ſome time treated as queen of France; but as Louis grew up, it was eaſy to ſee that he had contracted an inveterate hatred againſt the intended partner of his bed. The miniſter, therefore, at laſt conſented that the princeſs ſhould be ſent back; an affront ſo much reſented by the queen her mother, that it had almoſt produced a war betwixt the two nations.

156 The king takes the government into his own hands.

157 The infanta of Spain ſent back.

The diſſolution of the marriage of Louis was the laſt act of Condé's adminiſtration; and the procuring of a new match was the firſt act of his ſucceſſor Cardinal Fleury. The princeſs pitched upon was the daughter of Staniſlaus Leſczinſki, king of Poland, who had been depoſed by Charles XII. of Sweden. The princeſs was deſtitute of perſonal charms, but of an amiable diſpoſition; and though it is probable that ſhe never poſſeſſed the love of her huſband, her excellent qualities could not but extort his eſteem; and the birth

158 Marriage with the daughter of Staniſlaus king of Poland.

France. birth of a prince ſoon after their marriage removed all the fears of the people concerning the ſucceſſion.

Cardinal Fleury continued the pacific ſchemes purſued by his predeceſſors; though they were ſomewhat interrupted by the war which took place in the year 1733. Notwithſtanding the connexion betwixt that monarch and the French nation, however, Fleury was ſo parſimonious in his aſſiſtance, that only 1500 ſoldiers were ſent to relieve Dantzic, where Staniſlaus himſelf reſided, and who at that time was beſieged by the Ruſſians. This pitiful reinforcement was ſoon overwhelmed by a multitude of Ruſſians; and Staniſlaus was at laſt obliged to renounce all thoughts of the crown of Poland, though he was permitted to retain the title of king: and that this title might not be merely nominal, the king of France conſented to beſtow upon him the duchies of Bar and Lorrain; ſo that, after the death of Staniſlaus, theſe territories were indiſſolubly united to the dominions of France. Fleury ſteadily purſued his pacific plans, and the diſputes between Spain and England in 1737 very little affected the peace of France; and it muſt be remembered to his praiſe, that inſtead of fomenting the quarrels betwixt the neighbouring potentates, he laboured inceſſantly to keep them at peace. He reconciled the Genoeſe and Corſicans, who were at war; and his mediation was accepted by the Ottoman Porte; who at that time carried on a ſucceſsful war with the emperor of Germany, but made peace with him at the interceſſion of the cardinal. All his endeavours to preſerve the general peace, however, proved at laſt ineffectual. The death of the emperor Charles VI. in 1740, the laſt prince of the houſe of Auſtria, ſet all Europe in a flame. The emperor's eldeſt daughter, Maria Thereſa, claimed the Auſtrian ſucceſſion, which comprehended the kingdoms of Hungary and Bohemia, the duchy of Sileſia, Auſtrian Suabia, Upper and Lower Auſtria, Stiria, Carinthia, Carniola; the four foreſt towns; Burgaw; Briſgaw; the Low Countries; Friuli; Tyrol; the duchy of Milan; and the duchies of Parma and Placentia. Among the many competitors who pretended a right to ſhare, or wholly to inherit, theſe extenſive dominions, the king of France was one. But as he wiſhed not to awaken the jealouſy of the European princes by preferring directly his own pretenſions, he choſe rather to ſupport thoſe of Frederick III. who laid claim to the duchy of Sileſia. This brought on the war of 1740; and of which an account is given under the articles BRITAIN and PRUSSIA. It was terminated in 1748 by the treaty of Aix-la Chapelle; but to this Louis, who ſecretly meditated a ſevere vengeance againſt Britain, only conſented, that he might have time to recruit his fleet, and put himſelf ſomewhat more upon an equality with this formidable power. But while he meditated great exploits of this kind, the internal tranquillity of the kingdom was diſturbed by violent diſputes betwixt the clergy and parliaments of France. In the reign of Louis XIV. there had been violent conteſts betwixt the Janſeniſts and Jeſuits concerning free will and other obſcure points of theology; and the opinions of the Janſeniſts had been declared heretical by the celebrated papal bull named *Unigenitus*; the reception of which was enforced by the king, in oppoſition to the parliaments, the archbiſhop of Paris, and the body of the people. The archbiſhop, with 15 other prelates, protected againſt it as an infringement of the rights of the Gallican church, of the laws of the realm, and an inſult on the rights of the people themſelves. The duke of Orleans favoured the bull by inducing the biſhops to ſubmit to it; but at the ſame time ſtopped a perſecution which was going on againſt its opponents. Thus matters paſſed over till the concluſion of the peace; a ſhort time after which, the jealouſy of the clergy was awakened by an attempt of the miniſter of ſtate to inquire into the wealth of individuals of their order. To prevent this, they revived the conteſt about the bull Unigenitus; and it was reſolved, that confeſſional notes ſhould be obtained of dying perſons; that theſe notes ſhould be ſigned by prieſts who maintained the authority of the bull; and that, without ſuch notes, no perſon could obtain a viaticum, or extreme unction. On this occaſion the new archbiſhop of Paris, and the parliament of that city, took oppoſite ſides; the latter impriſoning ſuch of the clergy as refuſed to adminiſter the ſacraments excepting in the circumſtances above mentioned. Other parliaments followed the example of that of Paris; and a war was inſtantly kindled betwixt the civil and eccleſiaſtical departments of the ſtate. In this diſpute the king interfered, forbade the parliaments to take cognizance of eccleſiaſtical proceedings, and commanded them to ſuſpend all proſecutions relative to the refuſal of the ſacraments: but inſtead of acquieſcing, the parliaments preſented new remonſtrances, refuſed to attend any other buſineſs, and reſolved that they could not obey this injunction without violating their duty as well as their oath. They cited the biſhop of Orleans before their tribunal; and ordered all writings, in which its juriſdiction was diſputed, to be burnt by the executioner. By the aſſiſtance of the military, they enforced the adminiſtration of the ſacraments to the ſick, and ceaſed to diſtribute that juſtice to the ſubject for which they had been originally inſtituted. The king, enraged at their obſtinacy, arreſted and impriſoned four of the members who had been moſt obſtinate, and baniſhed the remainder to Bourges, Poictiers, and Auvergne; while, to prevent any impediment from taking place in the adminiſtration of juſtice by their abſence, he iſſued letters patent, by which a royal chamber for the proſecution of civil and criminal ſuits was inſtituted. The counſellors refuſed to plead before theſe new courts; and the king, finding at laſt that the whole nation was about to fall into a ſtate of anarchy, thought proper to recal the parliament. The baniſhed members entered Paris amidſt the acclamations of the inhabitants; and the archbiſhop, who ſtill continued to encourage the prieſts in refuſing the ſacraments, was baniſhed to his ſeat at Conſlans; the biſhops of Orleans and Troyes were in like manner baniſhed, and a calm for the preſent reſtored to the kingdom.

France.

159 Diſputes betwixt the parliaments and clergy.

160 Parliament of Paris baniſhed.

The tranquillity thus eſtabliſhed was of no long duration. In the year 1756, the parliaments again fell under the diſpleaſure of their king by their imprudent perſecution of thoſe who adhered to the bull Unigenitus. They proceeded ſo far in this oppoſition as to refuſe to regiſter certain taxes abſolutely neceſſary for the carrying on of the war. By this Louis was ſo provoked, that he ſuppreſſed the fourth and fifth chambers of inqueſts, the members of which had diſtin-

161 New diſputes betwixt the king and parliament.

France. guiſhed themſelves by their oppoſition to his will. He commanded the bull Unigenitus to be reſpected, and prohibited the ſecular judges from ordering the adminiſtration of the ſacraments. On this 15 counſellors of the great chamber reſigned their offices, and 124 members of the different parliaments followed their example; and the moſt grievous diſcontents took place throughout the kingdom. An attempt was made by a fanatic, named *Damien*, to aſſaſſinate him; and the king was actually wounded, though ſlightly, between the ribs, in the preſence of his ſon and in the midſt of his guards. The aſſaſſin was put to the moſt exquiſite tortures; in the midſt of which he perſiſted, in the moſt obſtinate manner, to declare that he had no intention to kill the king; but that his deſign was only to wound him, that God might touch his heart, and incline him to reſtore peace to his dominions, &c. Theſe expreſſions, which undoubtedly indicated inſanity, had no effect on his mercileſs judges, who conſigned him to one of the moſt horrid deaths the ingenuity or cruelty of man could invent. This attempt, however, ſeems to have had ſome effect upon the king; for he ſoon after baniſhed the archbiſhop of Paris, who had been recalled, and once more accommodated matters with his parliament.

162 Family compact between France and Spain eſtabliſhed.

The unfortunate event of the war of 1755 had brought the nation to the brink of ruin, when Louis implored the aſſiſtance of Spain; and on this occaſion the celebrated *Family Compact* was ſigned; by which, with the ſingle exception of the American trade, the ſubjects of France and Spain are naturalized in both kingdoms, and the enemy of the one ſovereign is invariably to be looked upon as the enemy of the other. At that time, however, the aſſiſtance of Spain availed very little; both powers were reduced to the loweſt ebb, and the arms of Britain were triumphant in every quarter of the globe. See the article BRITAIN.

The peace concluded at Paris in the year 1763, though it freed the nation from a moſt deſtructive and bloody war, did not reſtore its internal tranquillity. The parliament, eager to purſue the victory they had formerly gained over their religious enemies, now directed their efforts againſt the Jeſuits, who had obtained and enforced the bull Unigenitus. That once powerful order, however, was now on the brink of deſtruction. A general deteſtation of its members had taken place throughout the whole world. A conſpiracy formed by them againſt the king of Portugal, and from which he narrowly eſcaped, had roufed the indignation of Europe, and this was ſtill farther inflamed by ſome fraudulent practices of which they had been guilty in France. Le Valette, the chief of their miſſionaries at Martinico, had, ever ſince the peace of Aix-la-Chapelle, carried on a very extenſive commerce, inſomuch that he even aſpired at monopolizing the whole Weſt India trade when the war with Britain commenced in 1755. Leonay and Gouffre, merchants at Marſeilles, in expectation of receiving merchandiſe to the value of two millions from him, had accepted of bills drawn by the Jeſuits to the amount of a million and a half. Unhappily they were diſappointed by the vaſt number of captures made by the Britiſh; in conſequence of which they were obliged to apply to the Society of Jeſuits at large: but they, either ignorant of their true intereſt, or too ſlow in giving aſſiſtance, ſuffered the merchants to ſtop payment; and thus not only to bring ruin upon themſelves, but to involve, as is uſual in ſuch caſes, a great many others in the ſame calamity. Their creditors demanded indemnification from the Society at large; and on their refuſal to ſatisfy them, brought their cauſe before the parliament of Paris. That body, eager to revenge themſelves on ſuch powerful adverſaries, carried on the moſt violent perſecutions everywhere againſt them. In the courſe of theſe, the volume containing the conſtitution and government of the order itſelf was appealed to, and produced in open court. It then appeared, that the order of Jeſuits formed a diſtinct body in the ſtate, ſubmitting implicitly to their chief, who alone was abſolute over their lives and fortunes. It was likewiſe diſcovered that they had, after a former expulſion, been admitted into the kingdom upon conditions which they had never fulfilled; and to which their chief had obſtinately refuſed to ſubſcribe; conſequently that their exiſtence at that time in the nation was merely the effect of toleration. The event was, that the writings of the Jeſuits were pronounced to contain doctrines ſubverſive of all civil government, and injurious to the ſecurity of the ſacred perſons of ſovereigns: the attempt of Damien againſt the king was attributed to them, and every thing ſeemed to prognoſticate their ſpeedy diſſolution. In this critical moment, however, the king interfered, and by his royal mandate ſuſpended all proceedings againſt them for a year; a plan of accommodation was drawn up, and ſubmitted to the pope and general of the order: but the latter, by his ill-timed haughtineſs, entirely overthrew the hope of reconciliation. The king withdrew his protection, and the parliament redoubled their efforts againſt them. The bulls, briefs, conſtitutions, and other regulations of the Society, were determined to be encroachments on authority, and abuſes of government; the Society itſelf was finally diſſolved, and its members declared incapable of holding any clerical or municipal offices; their colleges were ſeized; their effects confiſcated, and the order annihilated ever ſince.

France.

163 Expulſion of the Jeſuits.

164 Contentions betwixt the king and his parliament.

The parliament, having gained this victory, next made an attempt to ſet bounds to the power of the king himſelf. They now refuſed to regiſter an edict which Louis had iſſued for the continuance of ſome taxes which ſhould have ended with the war, and likewiſe to conform to another by which the king was enabled to redeem his debts at an inadequate price. The court attempted to get the edicts regiſtered by force, but the parliaments everywhere ſeemed inclined to reſiſt to the laſt. In 1766, the parliament of Brittany refuſed the crown a gift of 700,000 livres; in conſequence of which they were ſingled out to bear the weight of royal vengeance; but while matters were on the point of coming to extremities, the king thought proper to drop the proceſs altogether, and to publiſh a general amneſty. The parliaments, however, now affected to deſpiſe the royal clemency; which exaſperated the king to ſuch a degree, that he ordered the counſellors of the parliament of Brittany (who had refuſed to reſume the functions of which he deprived them) to be included in the liſt of thoſe who were to be drafted for militia; and thoſe upon whom the lot fell were immediately obliged to join their reſpective regiments;

France. ments; the reſt being employed in forming the city guard. The parliament of Paris remonſtrated ſo freely upon this conduct of the king, that they alſo fell under his cenſure; and Louis in the moſt explicit manner declared, that he would ſuffer no earthly power to interfere with his will; and the parliaments were for the preſent intimidated into ſubmiſſion.

The interval of domeſtic tranquillity which now took place, was employed by the king in humbling the pride of the pope, who refuſed to recal a brief he had publiſhed againſt the duke of Parma. On this the French monarch reclaimed the territories of Avignon and Venaiſſin; and while the pontiff denounced his unavailing cenſures againſt him, the marquis de Rochecouart, with a ſingle regiment of ſoldiers, drove out the troops of the pope, and took poſſeſſion of the territories in queſtion.

165 Iſland of Corſica reduced. A more formidable oppoſition was made by the natives of the ſmall iſland of Corſica; the ſovereignty of which had been transferred to France by the Genoeſe its former maſters, on condition that Louis ſhould reinſtate them in the poſſeſſion of the iſland of Caprala, which the Corſicans had lately reduced. Theſe iſlanders defended themſelves with the moſt deſperate intrepidity; and it was not till after two campaigns, in which ſeveral thouſands of the braveſt troops of France were loſt, that they could be brought under ſubjection.

166 Diſtreſſed ſtate of the nation. The ſatisfaction which this unimportant conqueſt might afford to Louis, was clouded by the diſtreſs of the nation at large. The Eaſt India Company had totally failed, and moſt of the capital commercial houſes in the kingdom were involved in the ſame calamity. The miniſter, the duc de Choiſeuil, by one deſperate ſtroke, reduced the intereſt of the funds to one half, and at the ſame time took away the benefit of the ſurvivorſhip in the tontines, by which the national credit was greatly affected; the altercation betwixt the king and his parliaments revived, and the diſſenſions became worſe than ever. The duc de Choiſeuil attempted in vain to conciliate the differences; his efforts tended only to bring misfortunes upon himſelf, and in 1771 he was baniſhed by the king, who ſuſpected him of favouring the popular party too much; and this was ſoon after followed by the baniſhment of the whole parliament of Paris, and that by the baniſhment of a number of others; new parliaments being everywhere choſen in place of thoſe who had been expelled. The people were by no means diſpoſed to pay the ſame regard to theſe new parliaments that they had done to the old ones; but every appearance of oppoſition was at laſt ſilenced by the abſolute authority of the king. In the midſt of this plentitude of power, however, which he had ſo ardently deſired, his health daily declined, and the end of his days was evidently at no great diſtance. As he had all along indulged himſelf in ſenſual pleaſures to the greateſt exceſs, ſo now they proved the immediate means of his deſtruction. His favourite miſtreſs, Madame de Pompadour, who for a long time governed him with an abſolute ſway, had long ſince been dead, and the king had for ſome time been equally enſlaved by the charms of Madame du Barre. At laſt even her beauty proved inſufficient to excite deſire; and a ſucceſſion of miſtreſſes became neceſſary to rouſe the languid appetites of the king. One of theſe, who was infected with the ſmallpox, communicated the diſeaſe to the king; who in a ſhort time died of it, notwithſtanding all the aſſiſtance that could be given him by the phyſicians. France. 167 Death of Louis XV.

The new king Louis XVI. grandſon to the former, aſcended the throne in the year 1774, in the 20th year of his age; and to ſecure himſelf againſt the diſeaſe which had proved fatal to his predeceſſor, ſubmitted to inoculation, with ſeveral others of the royal family. Their quick and eaſy recovery contributed much to extend that practice throughout the kingdom, and to remove the prejudices which had been entertained againſt it. 168 Reign of Louis XVI.

The king had no ſooner regained his health, than he applied himſelf diligently to extinguiſh the differences which had taken place betwixt his predeceſſor and the people. He removed thoſe from their employments who had given cauſe of complaint by their arbitrary and oppreſſive conduct; and he conciliated the affection of his ſubjects by removing the new parliaments and recalling the old ones.

But though the prudence of Louis had ſuggeſted to him theſe compliances, he endeavoured ſtill to preſerve pure and entire the royal authority. He explained his intentions by a ſpeech in the great chamber of parliament. "The ſtep that he had taken to enſure the tranquillity and happineſs of his ſubjects, ought not (he obſerved) to invalidate his own authority; and he hoped, from the zeal and attachment of the preſent aſſembly, an example of ſubmiſſion to the reſt of his ſubjects. Their repeated reſiſtance to the commands of his grandfather had compelled that monarch to maintain his prerogative by their baniſhment; and they were now recalled, in the expectation that they would quietly exerciſe their functions, and diſplay their gratitude by their obedience." He concluded with declaring, "That it was his deſire to bury in oblivion all paſt grievances; that he ſhould ever behold with extreme diſapprobation whatever might tend to create diviſions and diſturb the general tranquillity; and that his chancellor would read his ordinance to the aſſembly, from which they might be aſſured he would not ſuffer the ſmalleſt deviation to be made." That ordinance was conceived in the moſt explicit terms, and was immediately regiſtered by the king's command. The articles of it limited within very narrow bounds the pretenſions of the parliament of Paris: The members were forbidden to look upon themſelves as one body with the other parliaments of the kingdom, or to take any ſtep, or aſſume any title, that might tend towards or imply ſuch an union: They were enjoined never to relinquiſh the adminiſtration of public juſtice, except in caſes of abſolute neceſſity, for which the firſt preſident was to be reſponſible to the king; and it was added, that on their diſobedience the grand council might replace the parliament, without any new edict for the purpoſe. They were ſtill however permitted to enjoy the right of remonſtrating before the regiſtering of any edicts or letters patent which they might conceive injurious to the welfare of the people, provided they preſerved in their repreſentations the reſpect due to the throne. But theſe remonſtrances were not to be repeated; and the parliament, if they proved ineffectual, were to regiſter the edict objected to within a month at fartheſt from the firſt day of its

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being publiſhed. They were forbidden to iſſue any arrets which might excite trouble, or in any manner retard the execution of the king's ordinances; and they were aſſured by the king himſelf, at the concluſion of this code for their future conduct, that as long as they adhered to the bounds preſcribed, they might depend upon his countenance and protection. In ſhort, the terms on which Louis conſented to re-eſtabliſh the parliaments were ſuch, that they were reduced to mere cyphers, and the word of the king ſtill continued to be the only law in the kingdom. The archbiſhop of Paris, who had likewiſe preſumed to raiſe ſome commotions with regard to the bull Unigenitus, was obliged to ſubmit; and ſeverely threatened if he ſhould afterwards interfere in ſuch a cauſe.

The final conqueſt of the Corſicans, who, provoked by the oppreſſion of their governors, had once more attempted to regain their former liberty, was the firſt event of importance which took place after this reſtoration of tranquillity: but the kingdom was yet filled
1775. with diſorder from other cauſes. A ſcarcity of corn happening to take place juſt at the time that ſome regulations had been made by M. Turgot the new financier, the populace roſe in great bodies, and committed ſuch outrages, that a military force became abſolutely neceſſary to quell them; and it was not till upwards of 500 of theſe miſerable wretches were deſtroyed that they could be reduced. The king, however, by his prudent and vigorous conduct on this occaſion, ſoon put a ſtop to all riots, and eminently diſplayed his clemency as well as prudence in the methods he took for the reſtoration of the public tranquillity.

169 Humane edict in favour of deſerters.

The humanity of Louis was next ſhown in an edict which he cauſed to be regiſtered in parliament, ſentencing the deſerters from his army in future to work as ſlaves on the public roads, inſtead of puniſhing them as formerly with death; and with equal attention to the general welfare of his ſubjects, he ſeized the moment of peace to fulfil thoſe promiſes of economy which on his acceſſion he had given to the people. Various regulations took place in conſequence; particularly the ſuppreſſion of the mouſquetaires and ſome other corps, which being adapted more to the parade of guarding the royal perſon than any real military ſervice, were ſupported at a great expence, without any adequate return of benefit to the ſtate.

170 Suppreſſion of the mouſquetaires.

Particular attention was alſo paid to the ſtate of the marine; and the appointment of M. de Sartine in 1776 to that department did honour to the penetration of the ſovereign. That miniſter, fruitful in reſources, and unwearied in his application, was inceſſantly engaged in augmenting the naval ſtrength of his country; and the various preparations that filled the ports and docks created no ſmall uneaſineſs to the Britiſh court.

The next appointment made by the king was equally happy, and in one reſpect ſingular and unprecedented. M. Turgot, though poſſeſſed of integrity and induſtry, had not been able to command the public confidence. On his retreat, M. Clugny, intendant general of Bourdeaux, had been elevated to the vacant poſt: but he dying in a very ſhort ſpace, M. Taboureau des Reaux was appointed his ſucceſſor; and the king ſoon after aſſociated with him in the management of the finances M. Neckar, by birth a Swiſs, and by religion a Proteſtant. That gentleman, in the preceding reign, had been choſen to adjuſt ſome differences between the Eaſt India Company and the crown; and had diſcharged his truſt in a manner which gained the approbation of both parties. Poſſeſſed of diſtinguiſhed abilities, his appointment would have excited no ſurpriſe, had it not been contrary to the conſtant policy of France, which had carefully excluded the aliens of her country and faith from the controul of her revenue. It now ſtood forward as a new inſtance of enlargement of mind and liberality of ſentiment; and will to poſterity mark the prominent features of the reign of Louis XVI.

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171 Appointment of M. Neckar to the direction of the finances.

Although the French monarch was of a pacific diſpoſition, and not deſtitute of generoſity of ſentiment; yet his own and the public exultation had been openly and conſtantly proportioned to the ſucceſs of the Americans in their conteſt with Britain: the princes of the blood and the chief nobility were eager to embark in ſupport of the cauſe of freedom; and the prudence of the king and his moſt confidential miniſters alone reſtrained their ardour. The fatal events of the former war were ſtill impreſſed on the mind of Louis; and he could not readily conſent to expoſe his infant marine in a conteſt with a nation who had ſo frequently aſſerted the dominion of the ſeas, and ſo lately broken the united ſtrength of the houſe of Bourbon. At the ſame time, he was ſenſible that the opportunity of humbling thoſe haughty iſlanders ſhould not be entirely neglected, and that ſome advantages ſhould be taken of the preſent commotions in America. Two agents from the United States, Silas Deane and Dr Benjamin Franklin, had ſucceſſively arrived at Paris: and though all audience was denied them in a public capacity, ſtill they were privately encouraged to hope that France only waited the proper opportunity to vindicate in arms the independence of America. In the mean while, the American cruiſers were hoſpitably received into the French ports; artillery and all kinds of warlike ſtores were freely ſold or liberally granted to the diſtreſs of the coloniſts; and French officers and engineers, with the connivance of government, entered into their ſervice.

172 The French privately aſſiſt the Americans in their conteſt with Britain,

Some changes were about this time introduced into the different departments of ſtate. The conduct of M. Neckar in the finances had been attended with univerſal approbation; and M. Taboureau des Reaux, his colleague, had reſigned his ſituation, but ſtill retained the dignity of counſellor of ſtate. To afford full ſcope to the genius of M. Neckar, Louis determined no longer to clog him with an aſſociate: but, with the title of Director General of the Finances, ſubmitted to him the entire management of the funds and revenue of France. In the enſuing year, the Count de St Germains, ſecretary at war, died; and the prince de Montbarey, who had already filled an inferior ſituation in that department, was now appointed to ſucceed him.

In the mean time, Louis's negotiations with foreign courts were not neglected. He concluded a new treaty of alliance with Switzerland; vigilantly obſerved the motions of the different princes of Germany on the death of the elector of Bavaria; and when cloſely queſtioned by the Engliſh ambaſſador, Lord Stormont, reſpecting the various warlike preparations which were diligently

France. diligently continued through the kingdom, he replied, That at a time when the ſeas were covered with Engliſh fleets and American cruiſers, and when ſuch armies were ſent to the New World as had never before appeared there, it became prudent for him alſo to arm for the ſecurity of the colonies and the protection of the commerce of France. The king was not ignorant at the ſame time, that the remonſtrances of Great Britain, and the importunities of the agents of the United States, would ſoon compel him to adopt ſome deciſive line of conduct. This was haſtened by a new event diſaſtrous to Britain; the failure of General Burgoyne's expedition, and the capture of his army. The news of that event was received at Paris with unbounded exultation. M. Sartine, the marine ſuperintendant, was eager to meaſure the naval ſtrength of France with that of Great Britain; the queen, who had long ſeconded the applications of the American agents, now eſpouſed their cauſe with freſh ardour; and the pacific inclinations of Louis being overborne by the ſuggeſtions of his miniſters and the influence of the queen, it was at length determined openly to acknowledge the independence of the United States.

173 and at laſt openly acknowledge the independence of the United States.

Dr Franklin and Silas Deane, who had hitherto acted as private agents, were now acknowledged as public ambaſſadors from thoſe ſtates to the court of Verſailles; and a treaty of amity and commerce was ſigned between the two powers in the month of February 1778. The duke of Noailles, ambaſſador to the court of London, was in the month of March inſtructed to acquaint that court with the above treaty. At the ſame time he declared, that the contracting parties had paid great attention not to ſtipulate any excluſive advantages in favour of France, and that the United States had reſerved the liberty of treating with every nation whatever on the ſame footing of equality and reciprocity. But this ſtipulation was treated by the Britiſh with contempt; and the recal of Lord Stormont, their ambaſſador at Verſailles, was the ſignal for the commencement of hoſtilities.—The events produced by this war are related under the articles AMERICA, BRITAIN, and INDOSTAN. Here our chief buſineſs is with domeſtic tranſactions, the meaſures of the cabinet, and the internal economy of the ſtate.

In the year 1780 new changes in the French miniſtry took place. M. Bertin had reſigned the office of ſecretary of ſtate; the prince de Montbarey had retired from the poſt of ſecretary at war, and was ſucceeded by the Marquis de Segur. But the moſt important removal was that of M. Sartine, who had for ſeveral years preſided over the marine department, and whoſe unwearied application and ability had raiſed the naval power of France to a height that aſtoniſhed Europe: but his colleagues in the cabinet loudly arraigned a profuſion, which would have diverted into one channel the whole reſources of the kingdom; and his retreat opened a road to the ambition of the Marquis de Caſtries, who was appointed to ſupply his place.

174 Removal of M. de Sartine.

This year, the king fixed on the anniverſary of his birth day to render it memorable by a new inſtance of humanity: and he aboliſhed for ever the inhuman cuſtom of *putting the queſtion*, as it was called, by torture; a cuſtom which had been ſo eſtabliſhed by the practice of ages, that it ſeemed to be an inſeparable part of the conſtitution of the courts of juſtice in France. At the ſame time, to defray the charges of war, he continued to diminiſh his own expenditure; and ſacrificing his magnificence to the eaſe of his ſubject, diſmiſſed at once above 400 officers belonging to his court. France.

175 Diſmiſſion of M. Neckar.

Unhappily, however, the popular diſcontents were excited next year by the diſmiſſion of their favourite miniſter, M. Neckar. He had conceived the arduous but popular project of ſupporting a war by loans without taxes; and the rigid economy which he had introduced into all the departments of the royal houſehold, and the various reſources that preſented themſelves to his fertile genius, had ſupported him amidſt the difficulties that attended this ſyſtem. But his auſterity of temper had not rendered him equally acceptable to the ſovereign and his ſubjects; and the repeated reforms he had recommended were repreſented as inconſiſtent with the dignity of the crown; he was therefore in 1781 diſmiſſed from his office of comptroller-general; and M. Joli de Fleuri, counſellor of ſtate, was appointed to that important department. The defeat of the count de Graſſe happened next year, and impreſſed the kingdom with general grief and conſternation. Immenſe preparations were, however, made for the operations of 1783; and in conjunction with the courts of Madrid and the Hague, Louis was determined this year to make the moſt powerful efforts to bring the war to a concluſion. But in the midſt of theſe preparations, the voice of peace was again heard; and Louis was induced to liſten to the proffered mediation of the two firſt potentates in Europe, the emperor of Germany and the empreſs of Ruſſia. The count de Vergennes, who ſtill occupied the poſt of ſecretary of foreign affairs, was appointed to treat with Mr Fitzherbert the Britiſh miniſter at Bruſſels, but who had lately proceeded to Paris to conduct this important negotiation. The way was already ſmoothed for the reſtoration of public tranquillity, by proviſional articles ſigned at the concluſion of the laſt year between the ſtates of America and Great Britain, and which were to conſtitute a treaty of peace finally to be concluded when that between France and Great Britain took place. Preliminary articles were accordingly agreed upon and ſigned at Verſailles: theſe were ſoon after ſucceeded by a definitive treaty; and France, throughout her extenſive dominions, beheld peace once more eſtabliſhed. Though the late war had been attended by the moſt brilliant ſucceſs, and the independence of America ſeemed to ſtrike deep at the ſource of her rival's power, yet France herſelf had not been entirely free from inconvenience. The retreat of M. Neckar, had, as we have already obſerved, diminiſhed the public confidence; three different perſons who had ſince tranſiently occupied his poſt, increaſed the jealouſies of the people; and the failure of the celebrated Caiſſe d'Eſcompte completed the univerſal conſternation.

176 Peace concluded.

177 Of the Caiſſe d'Eſcompte.

That bank had been eſtabliſhed in the year 1776. The plan of it was formed by a company of private adventurers, and its capital was fixed at 500,000l. ſterling. The profeſſed deſign of the Company was to diſcount bills at ſhort dates, at the rate of four per cent. per annum: but as this intereſt could never be an equivalent for the capital ſunk by the proprietors, they were intruſted with the additional power of iſſuing notes to the amount of their capital, which, as they were

France. were capable at any time of being converted into ſpecie, might be often voluntarily taken by their cuſtomers from mere convenience. The reputation of the bank ſoon cauſed its ſtock to ſell above par: and its credit was ſtill at the higheſt, when to the aſtoniſhment of the nation it ſuddenly ſtopped payment on the 2d of October 1783. The cauſe aſſigned was an uncommon ſcarcity of ſpecie: But the public ſuſpected that the failure aroſe from a loan ſecretly made to government; and what confirmed the ſuſpicion was, that government about the ſame time ſtopped payment of the bills drawn upon them by their army in America.

Whatever was the cauſe of this event, the king was prevailed on to extend his protection to the Company. By four ſucceſſive edicts the banks in Paris were ordered to receive the notes of the Caiſſe d'Eſcompte as currency; and a lottery with a ſtock of one million ſterling, redeemable in eight years, being eſtabliſhed, the tickets were made purchaſable in notes of the Caiſſe d'Eſcompte. By theſe expedients the public confidence in that bank was revived, its buſineſs increaſed, and its ſtock roſe to above double the original ſubſcription; the bills from America were at the ſame time put in a train of payment, and public credit was reſtored throughout the kingdom. Some compenſation alſo for the expences that had been incurred during the late war, was drawn from a treaty with the United States of America. Theſe engaged to reimburſe France in the ſum of 18 millions of livres, which had been advanced in the hour of their diſtreſs; and Louis conſented to receive the money, as more convenient to the States, in the ſpace of 12 years, by 12 equal and annual payments.

178 Treaty between France and Holland.

The general peace was ſoon after followed by a particular treaty between France and Holland, which was effected with great addreſs by the Count de Vergennes. It included all the principles which can ſerve to cement in the cloſeſt union diſtinct nations under diſtinct governments; and by which they may mutually participate, in peace or in war, of good or of evil; and in all caſes adminiſter the moſt perfect aid, counſel, and ſuccour to each other. It alſo preſcribed, if their united good offices for the preſervation of peace ſhould prove ineffectual, the aſſiſtance they were to afford each other by ſea and land. France was to furniſh Holland with 10,000 effective infantry, 2000 cavalry, with 12 ſhips of the line and 6 frigates. Their high Mightineſſes, on the other ſide, in caſe of a marine war, or that France ſhould be attacked by ſea, were to contribute to her defence ſix ſhips of the line and three frigates; and in caſe of an attack on the territory of France, the States General were to have the option of furniſhing their land contingent either in money or troops, at the eſtimate of 5000 infantry and 1000 cavalry. Further, If the ſtipulated ſuccours ſhould be inſufficient for the defence of the party attacked, or for procuring a proper peace, they engaged to aſſiſt each other with all their forces, if neceſſary; it being however agreed that the contingent of troops to be furniſhed by the States General ſhould not exceed 20,000 infantry and 4000 cavalry. It was further added, that neither of the contracting powers ſhould diſarm, or make or receive propoſals of peace or truce, without the conſent of the other: they promiſed alſo not to contract any future alliance or engagement whatever, directly or indirectly, contrary to the preſent treaty; and on any treaties or negotiations being propoſed which might prove detrimental to their joint intereſt, they pledged their faith to give notice to each other of ſuch propoſals as ſoon as made. France.

Thus was Holland now converted into the firm ally of that power againſt whoſe encroaching ſpirit ſhe had formerly armed the moſt powerful kingdoms of Europe; while France having aſſerted the independence of America againſt Great Britain, and having converted an ancient and formidable foe into an uſeful friend, ſeemed to have attained an influence over the nations of the earth that ſhe had never before been poſſeſſed of.

But however exalted her preſent ſituation might appear, the ſeeds of future commotion were already apparent to an attentive obſerver. The applauſe that had attended the parliament of Paris in their ſtruggles with the late king might be conſidered as the firſt dawn of freedom; the language of that aſſembly had boldly inculcated to their countrymen their natural rights, and taught them to look with a leſs enraptured eye on the luſtre that encompaſſed the throne. The war in America had contributed to enlarge the political ideas of the French: they had on that occaſion ſtood forth as the champions of liberty, in oppoſition to regal power; and the officers, who had acted on that conſpicuous theatre, accuſtomed to think and ſpeak without reſtraint, on their return imparted to the provinces of France the flame of freedom which had been kindled in the wilds of America. From that moment the French, inſtead of ſilently acquieſcing under the edicts of their ſovereign, canvaſſed each action with bold and rigid impartiality; while the attachment of the army, which has ever been conſidered as the ſole foundation of deſpotiſm, gave way to the noble enthuſiaſm of liberty.

179 Conſequence to France from her interference between Britain and her colonies.

We have already noticed the public diſſatisfaction that had attended the diſmiſſion of M. Neckar; his tranſient ſucceſſor, M. de Fleury, had retired from the management of the finances in 1783, and the more tranſient adminiſtration of M. d'Ormeſſon had expired in the ſame year that gave it birth. On his retreat, M. de Calonne, who had ſucceſſively filled with acknowledged reputation the office of intendant of Mentz, and afterwards of the provinces of Flanders and Artois, was nominated to the poſt of comptroller-general. This gentleman, flexible and inſinuating, eloquent in converſation, and poliſhed in his manners, fertile in reſources and liberal in the diſpoſal of the public money, ſoon rendered himſelf acceptable to the ſovereign. But he did not enter upon his new and arduous ſtation favoured by the breath of popularity: he was reported to be more able than conſiſtent, and not to have tempered the ardour of his ſpirit by the ſeverity of deep reſearch; and the people, amidſt repeated loans, regretted that ſevere ſimplicity which had characterized the adminiſtration of M. Neckar.

180 Appointment and meaſures of M. de Calonne.

It was the bold and judicious meaſures of Calonne, however, that reſtored credit to the Caiſſe d'Eſcompte, which had ſtopped payment a few weeks before his acceſſion. His next meaſure, in 1784, the eſtabliſhment of the Caiſſe d'Amortiſſement, or ſinking fund, was entitled to a ſtill higher degree of applauſe. The plan of that fund was ſimple and moderate: It was to pay annually by government, into the hands of a board ſet apart

France. apart for that purpoſe, the entire intereſt of the national debts, whether in ſtock or annuities, together with an additional ſum of 120,000l. The annuities that would be extinguiſhed every year were eſtimated at 50,000l.; and in that proportion, the ſum ſet apart for the redemption of the national debt would annually increaſe. The operation of this new fund was limited to the term of 25 years; and during that term the annual receipt of the Caiſſe d'Amortiſſement is declared unalterable, and incapable of being diverted to any other object.

The principal meaſure of the next year was the eſtabliſhment of a new Eaſt India Company, (the conſtitutions of which have been already detailed: ſee COMPANY); —a meaſure not equally commendable with the preceding, and which did not fail to excite violent complaints. The time, however, was now approaching, when the neceſſities of the ſtate would compel him to meaſures ſtill more unpopular, and deſtined to undergo a ſeverer ſcrutiny. Although peace had been re-eſtabliſhed throughout Europe for three years, yet the finances of France ſeemed ſcarce affected by this interval of tranquillity, and it was found requiſite to cloſe every year with a loan. The public expenditure of 1785 might probably ſeem to ſanction this meaſure. It had been thought proper to fortify Cherbourg upon a large and magnificent ſcale; the claim of the emperor to the navigation of the Scheldt had obliged the French to increaſe their land forces, either to form a reſpectable neutrality, or to aſſiſt effectually their Dutch allies; and the marquis de Caſtries, fond of war, and profuſe in his deſigns, had not ſuffered the navy, which M. Sartine had ſurrendered into his hands, to decline during the interval of peace. The treaty of commerce concluded in the year 1786 with Great Britain was a new ſource of diſcontent.—Though regarded by the Engliſh manufacturers as far from advantageous, it excited in France ſtill louder murmurs. It was repreſented as likely to extinguiſh thoſe infant eſtabliſhments, which were yet unable to vie with the manufactures of England that had attained to maturity; and the market that it held out for the wines and oils of France was paſſed over in ſilence, while the diſtreſs of the artiſan was painted in the moſt ſtriking colours. But when the edict for regiſtering the loan at the concluſion of the laſt year, and which amounted to the ſum of three millions three hundred and thirty thouſand pounds, was preſented to the parliament of Paris, the murmurs of the people, through the remonſtrances of that aſſembly, aſſumed a more legal and formidable aſpect. The king, however, ſignified to the ſelect deputation that were commiſſioned to convey to him their remonſtrances, that he expected to be obeyed without farther delay. The ceremony of the regiſtering accordingly took place on the next day; but it was accompanied with a reſolution, importing, "that public economy was the only genuine ſource of abundant revenue, the only means of providing for the neceſſities of the ſtate, and reſtoring that credit which borrowing had reduced to the brink of ruin."

The king was no ſooner informed of this ſtep, than he commanded the attendance of the grand deputation of parliament; when he erazed from their records the reſolution that had been adopted; and obſerved, France. that though it was his pleaſure that the parliament ſhould communicate, by its reſpectful repreſentations, whatever might concern the good of the public, yet he never would allow them ſo far to abuſe his clemency as to erect themſelves into the cenſors of his government. At the ſame time, more ſtrongly to mark his diſpleaſure at their expoſtulations, he ſuperſeded one of their officers, who had appeared moſt active in forwarding the obnoxious reſolution.

M. de Calonne, however, though gratified by the approbation of his ſovereign, could not but feel himſelf deeply mortified by the oppoſition of the parliament. His attempts to conciliate that aſſembly had proved ineffectual: and he experienced their inflexible averſion at the critical juncture when their acquieſcence might have proved of the moſt eſſential ſervice. An anxious inquiry into the ſtate of the public finances had convinced him that the expenditure by far exceeded the revenue. In this ſituation, to impoſe new taxes was impracticable; to continue the method of borrowing was ruinous; to have recourſe only to economical reforms, would be found wholly inadequate; and he heſitated not to declare, that it would be impoſſible to place the finances on a ſolid baſis, but by the reformation of whatever was vicious in the conſtitution of the ſtate.

To give weight to this reform, M. de Calonne was ſenſible that ſomething more was neceſſary than the royal authority; he perceived that the parliament was neither a fit inſtrument for introducing a new order into public affairs, nor would ſubmit to be a paſſive machine for ſanctioning the plans of a miniſter, even if thoſe plans were the emanations of perfect wiſdom. Though originally a body of lawyers, indebted for their appointments to the king, there was not an attribute of genuine legiſlative aſſembly but what they ſeemed deſirous to engroſs to themſelves; and they had been ſupported in their pretenſions by the plaudits of the people, who were ſenſible that there was no other body in the nation that could plead their cauſe againſt royal or miniſterial oppreſſion. To ſuppreſs, therefore, the only power of controul that remained, and to render the government more arbitrary, was deemed too perilous a meaſure: yet to leave the parliament in the full poſſeſſion of their influence, an influence that the miniſter was convinced would be exerted againſt him, was at once to render his whole ſyſtem abortive.

In this dilemma, the only expedient that ſuggeſted itſelf was to have recourſe to ſome other aſſembly, more dignified and ſolemn in its character, and which ſhould in a greater degree conſiſt of members from the various orders of the ſtate and the different provinces of the kingdom. This promiſed to be a popular meaſure; it implied a deference to the people at large, and might be expected to prove highly acceptable. But the true and legitimate aſſembly of the nation, the States General, had not met ſince the year 1614; nor could the miniſter flatter himſelf with the hope of obtaining the royal aſſent to a meeting which a deſpotic ſovereign could not but regard with ſecret jealouſy. Another aſſembly had occaſionally been ſubſtituted in the room of the States General: this was diſtinguiſhed by the title of the *Notables;* and conſiſted of a number.

181 Aſſembly of the Notables.

France. ber of perſons from all parts of the kingdom, chiefly ſelected from the higher orders of the ſtate, and nominated by the king himſelf. This aſſembly had been convened by Henry IV. again by Louis XIII. and was now once more ſummoned by the authority of Louis XVI.

The writs for calling them together were dated on the 29th of December 1786; and they were addreſſed to ſeven prinees of the blood, nine dukes and peers of France, eight field mareſchals, twenty-two nobles, eight counſellors of ſtate, four maſters of requeſts, eleven archbiſhops and biſhops, thirty-ſeven of the heads of the law, twelve deputies of the *pays d'etats*, the lieutenant civil, and twenty-five magiſtrates of the different towns of the kingdom. The number of members was 144; and the 29th of January 1787 was the period appointed for their meeting.

Upon the arrival of the notables at Paris, however, the miniſter found himſelf yet unprepared to ſubmit his ſyſtem to their inſpection, and poſtponed the opening of the council to the 7th of February. A ſecond delay to the 14th of the ſame month was occaſioned by the indiſpoſition of M. de Calonne himſelf, and that of the count de Vergennes preſident of the council of finance and firſt ſecretary of ſtate; and a third procraſtination was the neceſſary reſult of the death of the count on the day previous to that fixed for the opening of the meeting. He was ſucceeded in the department of foreign affairs by the count de Montmorin, a nobleman of unblemiſhed character. But his loſs at this critical juncture was ſeverely felt by M. de Calonne; he alone, of all the miniſters, having entered with warmth and ſincerity into the plans of the comptroller general. The chevalier de Miromeſnil, keeper of the ſeals, was avowedly the rival and enemy of that ſtateſman. The marcſchal de Caſtries, ſecretary for the marine department, was perſonally attached to M. Neckar; and the baron de Breteuil, ſecretary for the houſehold, was the creature of the queen, and deeply engaged in what was called the Auſtrian ſyſtem.

182 Splendid project of M. de Calonne.

It was under theſe difficulties that M. de Calonne, on the 22d of February, firſt met the aſſembly of the notables, and opened his long-expected plan. He began by ſtating, that the public expenditure had for centuries paſt exceeded the revenue, and that a very conſiderable deficiency had of courſe exiſted; that the Miſſiſſippi ſcheme of 1720 had by no means, as might have been expected, reſtored the balance; and that under the economical adminiſtration of Cardinal Fleury the deficit ſtill exiſted; that the progreſs of this derangement under the laſt reign had been extreme; the deficiency amounting to three millions ſterling at the appointment of the Abbé Terray; who, however, reduced it to one million ſix hundred and ſeventy-five thouſand pounds; it decreaſed a little under the ſhort adminiſtrations that followed, but roſe again in conſequence of the war, under the adminiſtration of M. Neckar; and at his own acceſſion to office, it was three millions three hundred and thirty thouſand pounds.

In order to remedy this growing evil, M. Calonne recommended a territorial impoſt, in the nature of the Engliſh land tax, from which no rank or order of men were to be exempted; and an inquiry into the poſſeſſions of the clergy, which hitherto had been deemed ſacred from their proportion of the public burdens: the various branches of internal taxation were alſo to undergo a ſtrict examination; and a conſiderable reſource was preſented in mortgaging the demeſne lands of the crown. France.

The very neceſſity for theſe reforms was combated with a degree of boldneſs and force of reaſoning that could not fail of deeply impreſſing the aſſembly; and inſtead of meeting with a ready acquieſcence, the comptroller general was now launched into the boundleſs ocean of political controverſy. M. Neckar, previous to his retirement, had publiſhed his Compte rendu au Roy, in which France was repreſented as poſſeſſing a clear ſurplus of 425,000 pounds ſterling: this performance had been read with avidity, and probably contributed to eſtrange from the author the royal countenance; but the credit of it was ably vindicated by M. de Brienne archbiſhop of Thouloufe.

183 Oppoſed by Mirabeau and the biſhop of Thouloufe.

M. de Calonne met with a ſtill more formidable adverſary in the count de Mirabeau. This extraordinary man, reſtleſs in his diſpoſition, licentious in his morals, but bold, penetrating, and enterpriſing, had occaſionally viſited every court in Europe. He had been admitted at one time to the confidence of the miniſter; and had been directed, though in no oſtenſible character, to obſerve at Berlin, the diſpoſition of the ſucceſſor of the great Frederick; in this capacity he was frequently expoſed to neglect and diſappointment; his letters were often left unanſwered; diſguſt ſucceeded to admiration; and he who had entered the Pruſſian court the intimate friend, returned to Paris the avowed enemy, of M. de Calonne: While the archbiſhop arraigned the underſtanding, the count impeached the integrity, of the comptroller general.

The eloquence of M. de Calonne, however, might have ſucceſsfully vindicated his ſyſtem and reputation againſt the calculations of Brienne, and the invectives of Mirabeau; but he could not ſupport himſelf againſt the influence of the three great bodies of the nation. The ancient nobility and the clergy had ever been free from all public aſſeſſments; and had the evil gone no farther, it might have been ſtill perhaps borne with patience; but through the ſhameful cuſtom of ſelling patents of nobility, ſuch crowds of new nobleſſe ſtarted up, that every province in the kingdom was filled with them. The firſt object with thoſe who had acquired fortunes rapidly, was to purchaſe a patent; which, beſides gratifying their vanity, afforded an exemption to them and their poſterity from contributing proportionably to the exigencies of the ſtate; the magiſtracies likewiſe throughout the kingdom enjoyed their ſhare of the exemptions; ſo that the whole weight of the taxes fell on thoſe who were leaſt able to bear them.

184 and by the principal nobility, clergy, and magiſtrates.

The miniſter's deſign, then, of equalizing the public burdens, and by rendering the taxes general diminiſhing the load borne by the lower and moſt uſeful claſſes of people, though undoubtedly great and patriotic, at once united againſt him the nobility, the clergy, and the magiſtracy; and the event was ſuch as might be expected: the intrigues of thoſe three bodies raiſed againſt him ſo loud a clamour, that finding it impoſſible to ſtem the torrent, he not only reſigned his place

France.

place on the 12th of April, but ſoon after retired to England from the ſtorm of perſecution.

185 Upon which M. de Calonne reſigns.

In the midſt of theſe tranſactions at home, Louis's attention was alſo called to the ſtate of affairs in the republic of Holland, his new and cloſe ally. The prince of Orange had been ſtripped of all authority by the ariſtocratic party; and, retiring from the Hague, maintained the ſhadow of a court at Nimeguen. His brother-in-law, however, the new king of Pruſſia, exerted his endeavours to promote the intereſts of the ſtadtholder; and, having offered, in concert with France, to undertake the arduous taſk of compoſing the differences which diſtracted the republic, the propoſal was received with apparent cordiality by the court of Verſailles. At the ſame time it could ſcarce be expected that France would become the inſtrument of reſtoring the prince of Orange to that ſhare of power which he had before occupied, and thus abandon one of the longeſt and moſt favourite objects of her policy, the eſtabliſhing a ſupreme and permanent controul in the affairs of Holland. In fact, the conditions which were framed by the Louveſtein faction, as the baſis of reconciliation, were ſuch as plainly indicated their deſign to reduce the influence and authority of the ſtadtholder within very narrow limits. On his renouncing his right of filling up the occaſional vacancies in the town ſenates, he was to be reſtored to the nominal office of captain general: but he was to be reſtrained from marching the troops into or out of any province, without leave from the reſpective provinces concerned; and he was alſo to ſubſcribe to a reſolution paſſed ſome time before by the ſenate of Amſterdam, that the command ſhould at all times be revocable at the pleaſure of the ſtates. Had the prince acquieſced in theſe preliminaries, France would have completely attained the object of her long negotiations, and by means of the Louveſtein faction have acquired the aſcendency that ſhe had repeatedly ſought in the councils of Holland. But under the difficulties that ſurrounded him, the prince of Orange was admirably ſupported and aſſiſted by the genius, the ſpirit, and the abilities of his conſort: ſhe firmly rejected every meaſure tending to abridge any rights that had been attached to the office of ſtadtholder; and M. de Rayneval, the French negociator, having in vain endeavoured to overcome her reſolution, broke off the correſpondence between the Hague and Nimeguen, and returned to Paris about the middle of January 1787.

186 Diſturbances in Holland.

187 Attempts f the rench to upport the epublican arty.

But the republican party were totally diſappointed in their hopes from France. The court of Verſailles had indeed long truſted to the natural ſtrength of this party, and had been aſſiduous during the whole ſummer in endeavouring to ſecond them by every ſpecies of ſuccours that could be privately afforded. Crowds of French officers arrived daily in Holland; and either received commiſſions in the ſervice of the ſtates, or acted as volunteers in their troops. Several hundreds of tried and experienced ſoldiers were ſelected from different regiments; and being furniſhed with money for their journey, and aſſurances of future favour, were deſpatched in ſmall parties to join the troops, and help to diſcipline the burghers and volunteers. A conſiderable corps of engineers were alſo directed to proceed ſilently and in diſguiſe towards Amſterdam, and to aſſiſt in ſtrengthening the works of that city. Theſe aids, which might have proved effectual had the conteſt been confined to the ſtates of Holland and the ſtadtholder, were overwhelmed in the rapid invaſion of the Pruſſians; and the court of Berlin had taken its meaſures with ſo much celerity, and the ſituation of the republicans was already become ſo deſperate, that it was doubtful whether their affairs could be reſtored by any aſſiſtance that France was capable of immediately adminiſtering. Yet on Great Britain fitting out a ſtrong ſquadron of men of war at Portſmouth to give confidence to the operations of the king of Pruſſia, the court of Verſailles alſo ſent orders to equip 16 ſail of the line at Breſt, and recalled a ſmall ſquadron which had been commiſſioned on a ſummer's cruiſe on the coaſt of Portugal. But in theſe preparations Louis ſeemed rather to regard his own dignity, than to be actuated by any hopes of effectually relieving his allies. All oppoſition in Holland might be already conſidered as extinguiſhed. The ſtates aſſembled at the Hague had officially notified to the court of Verſailles, that the diſputes between them and the ſtadtholder were now happily terminated; and as the circumſtances which gave occaſion for their application to that court no longer exiſted, ſo the ſuccours which they had then requeſted would now be unneceſſary.

France.

Under theſe circumſtances, France could only wiſh to extricate herſelf from her preſent difficulty with honour. She therefore readily liſtened to a memorial from the Britiſh miniſter at Paris: who propoſed, in order to preſerve the good underſtanding between the two crowns, that all warlike preparations ſhould be diſcontinued, and that the navies of both kingdoms ſhould be again reduced to the footing of a peace eſtabliſhment. This was gladly acceded to by the court of Verſailles; and that harmony which had been tranſiently interrupted between the two nations was reſtored.

188 Domeſtic concerns of France.

Though the French king could not but ſenſibly feel the mortification of thus relinquiſhing the aſcendency which he had attained in the councils of Holland, the ſtate of his own domeſtic concerns and the internal ſituation of his kingdom furniſhed matter for more ſerious reflection. The diſmiſſion of M. de Calonne had left France without a miniſter, and almoſt without a ſyſtem; and though the king bore the oppoſition of the notables with admirable temper, yet the diſappointment that he had experienced ſunk deep into his mind. Without obtaining any relief for his moſt urgent neceſſities, he perceived too late that he had opened a path to the reſtoration of the ancient conſtitution of France, which had been undermined by the crafty Louis XI. and had been nearly extinguiſhed by the daring and ſanguinary counſels of Richelieu under Louis XIII. The notables had indeed demeaned themſelves with reſpect and moderation, but at the ſame time they had not been deficient in firmneſs. The appointment of the archbiſhop of Thouloufe, the vigorous adverſary of M. de Calonne, to the office of comptroller-general, probably contributed to preſerve the appearance of good humour in that aſſembly; yet the

189 Aſſembly of the Notables diſſolved.

France. the propoſed territorial impoſt, or general land tax, which was an object ſo ardently coveted by the court, was rejected. Louis, therefore, deprived of any further hope of rendering the convention ſubſervient to his embarraſſments, determined to diſſolve the aſſembly; which he accordingly did, with a very moderate and conciliatory ſpeech to the members on their diſmiſſion.

190 Refuſal of the parliament to regiſter the new taxes.

Thus diſappointed of the advantage which he had flattered himſelf he would have drawn from the acquieſcence of the notables, the king was obliged now to recur to the uſual mode of raiſing money by the royal edicts; among the meaſures propoſed for which purpoſe were the doubling of the poll tax, the re-eſtabliſhment of the third twentieth, and a ſtamp duty. But the whole was ſtrongly diſapproved by the parliament of Paris; and that aſſembly, in the moſt poſitive terms, refuſed to regiſter the edict. Louis was obliged to apply, as the laſt reſort, to his abſolute authority; and, by holding what is called *a bed of juſtice*, compelled them to enrol the impoſts.

The parliament, though defeated, were far from ſubdued; and on the day after the king had held his bed of juſtice, they entered a formal proteſt againſt the edict; declaring, "that it had been regiſtered againſt their approbation and conſent, by the king's expreſs command; that it neither ought nor ſhould have any force; and that the firſt perſon who ſhould preſume to attempt to carry it into execution, ſhould be adjudged a traitor, and condemned to the galleys."—This ſpirited declaration left the king no other alternative, than either proceeding to extremities in ſupport of his authority, or relinquiſhing for ever after the power of raiſing money upon any occaſion without the conſent of the parliament. Painful as every appearance of violence muſt have proved to the mild diſpoſition of Louis, he could not conſent to ſurrender, without a ſtruggle, that authority which had been ſo long exerciſed by his predeceſſors. Since the commencement of the preſent diſcontents, the capital had been gradually filled with conſiderable bodies of troops; and about a week after the parliament had entered the proteſt, an officer of the French guards, with a party of ſoldiers, went at break of day to the houſe of each individual member, to ſignify to him the king's command, that he ſhould immediately get into his carriage, and proceed to Troyes, a city of Champagne, about 70 miles from Paris, without writing or ſpeaking to any perſon out of his own houſe before his departure. Theſe orders were ſerved at the ſame inſtant; and before the citizens of Paris were acquainted with the tranſaction, their magiſtrates were already on the road to their place of baniſhment.

191 The members baniſhed.

Previous to their removal, however, they had preſented a remonſtrance on the late meaſures of government, and the alarming ſtate of public affairs. In ſtating their opinions on taxes, they declared, that neither the parliaments, nor any other authority, excepting that of the three eſtates of the kingdom collectively aſſembled, could warrant the laying of any permanent tax upon the people; and they ſtrongly enforced the renewal of thoſe national aſſemblies, which had rendered the reign of Charlemagne ſo great and illuſtrious.

This requiſition of the parliaments to re-eſtabliſh the national council, or ſtates general, was the more honourable, as the former aſſemblies muſt have ſunk under the influence of the latter, and returned to their original condition of mere regiſters and courts of law. The confidence and attachment of the people of conſequence roſe in proportion to this inſtance of diſintereſtedneſs; their murmurs were openly expreſſed in the ſtreets of the capital, and the general diſſatisfaction was augmented by the ſtop that was put to public buſineſs by the exile of the parliament. France.

The cabinet at the ſame time was apparently weak, diſunited, and fluctuating; and continual changes took place in every department of the ſtate. Louis, averſe to rigorous counſels, wiſhed to allay the growing diſcontent by every conceſſion that was conſiſtent with his dignity; but it was generally believed, that the queen ſtrongly diſſuaded him from any ſtep that might tend to the diminution of the royal authority. The influence of that princeſs in the cabinet was undoubtedly great: but the popularity which once had accompanied her was no more; and ſome imputations on private levity, which had been rumoured through the capital, were far from rendering her acceptable to the majority of the people; while the Count d'Artois, the king's brother, who had expreſſed himſelf in the moſt unguarded terms againſt the conduct of the parliament, ſtood expoſed to all the conſequences of popular hatred.

Nor was it only in the capital that the flame of liberty once more burſt forth; it blazed with equal ſtrength in the provincial parliaments. Among various inſtances of this nature, the parliament of Grenoble paſſed a decree againſt *lettres de cachet*, the moſt odious engine of arbitrary power; and declared the execution of them within their juriſdiction, by any perſon, and under whatever authority, to be a capital crime.

The king had endeavoured to ſoothe the Pariſians by new regulations of economy, and by continual retrenchments in his houſehold: but theſe inſtances of attention, which once would have been received with the loudeſt acclamations, were now diſregarded under their affliction for the abſence of their parliament. His majeſty, therefore, in order to regain the affections of his ſubjects, conſented to reſtore that aſſembly; abandoning at the ſame time the ſtamp duty, and the territorial impoſt, which had been the ſources of diſpute. Theſe meaſures were, however, inſufficient to eſtabliſh harmony between the court and the parliament. The neceſſities of the ſtate ſtill continued; nor could the deficiency of the revenue be ſupplied but by extraordinary reſources, or a long courſe of rigid frugality. About the middle of November 1787, in a full meeting of the parliament, attended by all the princes of the blood and the peers of France, the king entered the aſſembly, and propoſed two edicts for their approbation: one was for a new loan of 450 millions, near 19 millions ſterling: the other was for the re-eſtabliſhment of the Proteſtants in all their ancient civil rights; a meaſure which had long been warmly recommended by the parliament, and which was probably now introduced to procure a better reception to the loan.

192 Recalled.

On

France.

On this occaſion, the king delivered himſelf in a ſpeech of uncommon length, filled with profeſſions of regard for the people, but at the ſame time ſtrongly expreſſive of the obedience he expected to his edicts. Louis probably imagined, that the dread of that baniſhment from which the members had been ſo lately recalled would have enſured the acquieſcence of the aſſembly; but no ſooner was permiſſion announced for every member to deliver his ſentiments, than he was convinced that their ſpirits remained totally unſubdued. An animated debate took place, and was continued for nine hours; when the king, wearied by perpetual oppoſition, and chagrined at ſome freedoms uſed in their debates, ſuddenly roſe and commanded the edict to be regiſtered without further delay. This meaſure was moſt unexpectedly oppoſed by the duke of Orleans, firſt prince of the blood; who, conſidering it as an infringement of the rights of parliament, proteſted againſt the whole proceedings of the day as being thereby null and void. Though Louis could not conceal his aſtoniſhment and diſpleaſure at this deciſive ſtep, he contented himſelf with repeating his orders; and immediately after, quitting the aſſembly, retired to Verſailles. On the king's departure, the parliament confirmed the proteſt of the duke of Orleans; and declared, that as their deliberations had been interrupted, they conſidered the whole buſineſs of that day as of no effect.

193 Oppoſe the edict for a loan.

It was not to be ſuppoſed that Louis would ſuffer ſo bold an attack on his power with impunity. Accordingly, a letter was next day delivered to the duke of Orleans, commanding him to retire to Villars Cotterel, one of his ſeats, about 15 leagues from Paris, and to receive no company there except his own family; at the ſame time, the Abbé Sabatiere and M. Freteau, both members of the parliament, and who had diſtinguiſhed themſelves in the debate, were ſeized under the authority of lettres de cachet, and conveyed, the firſt to the caſtle of Mont St Michel in Normandy, the laſt to a priſon in Picardy. This act of deſpotiſm did not fail immediately to rouſe the feelings of the parliament. On the following day they waited on the king, and expreſſed their aſtoniſhment and concern that a prince of the blood royal had been exiled, and two of their members impriſoned, for having declared in his preſence what their duty and conſciences dictated, and at a time when his majeſty had announced that he came to take the ſenſe of the aſſembly by a plurality of voices. The anſwer of the king was reſerved, forbidding, and unſatisfactory; and tended to increaſe the reſentment of the parliament. At the ſame time, it did not prevent them from attending to the exigencies of the ſtate; and convinced of the emergency, they conſented to regiſter the loan for 450 millions of livres, which had been the ſource of this unfortunate difference. This conceſſion contributed to ſoften the mind of the king, and the ſentence of the two magiſtrates was in conſequence changed from impriſonment to exile; M. Freteau being ſent to one of his country ſeats, and the Abbé Sabatiere to a convent of Benedictines.

194 Duke of Orleans and two members baniſhed.

195 Strong remonſtrances of the parliament.

The parliament, however, was not to be ſoothed by that meaſure to give up the points againſt which they had originally remonſtrated. In a petition conceived with freedom, and couched in the moſt animated language, they boldly reprobated the late acts of arbitrary violence, and demanded the entire liberation of the perſons againſt whom they had been exerted. We have already noticed the fluctuating counſels of the court of Verſailles; and that Louis, as often as he was left to purſue his own inclinations, adopted meaſures of reconciliation. On the preſent occaſion, in the beginning of the year 1788, he recalled the duke of Orleans to court, who ſoon after obtained leave to retire to England; and he permitted the return of the Abbé Sabatiere and M. Freteau to the capital.

France.

196 Duke of Orleans recalled.

The parliament, however, had not confined their demands to the liberation of thoſe gentlemen; but had alſo echoed the remonſtrances of the parliament of Grenoble, and had loudly inveighed againſt the execution of *lettres de cachet*. Theſe repeated remonſtrances, mingled with perſonal reflections, ſeconded moſt probably the ſuggeſtions of the queen, and Louis was once more inſtigated to meaſures of ſeverity. Meſſ. d'Eſpremenil and Monſambert, whoſe bold and pointed harangues had preſſed moſt cloſely on the royal dignity, were doomed to experience its immediate reſentment. While a body of armed troops ſurrounded the hotel in which the parliament were convened, Colonel Degout entered the aſſembly, and ſecured the perſons of the obnoxious members, who were inſtantly conducted to different priſons. This new inſtance of arbitrary violence occaſioned a remonſtrance from parliament, which in boldneſs far exceeded all the former repreſentations of that aſſembly. They declared they were now more ſtrongly confirmed, by every proceeding, of the entire innovation which was aimed at in the conſtitution. "But, Sire," added they, "the French nation will never adopt the deſpotic meaſures to which you are adviſed, and whoſe effects alarm the moſt faithful of your magiſtrates; we ſhall not repeat all the unfortunate circumſtances which afflict us; we ſhall only repreſent to you with reſpectful firmneſs, that the fundamental laws of the kingdom *muſt* not be trampled upon, and that *your authority can only be eſteemed ſo long as it is tempered with juſtice*."

197 New remonſtrances.

Language ſo pointed and deciſive, and which aſſerted the controlling power of the laws above the regal authority, could not fail of ſeriouſly alarming the king; and with a view to diminiſh the influence of parliament, it was determined again to convene the notables. Accordingly, about the beginning of May, Louis appeared in that aſſembly: and after complaining of the exceſſes in which the parliament of Paris had indulged themſelves, and which had drawn down his reluctant indignation on a few of the members, he declared his reſolution, inſtead of annihilating them as a body, to recal them to their duty and obedience by a ſalutary reform. M. de la Moignon, as keeper of the ſeals, then explained his majeſty's pleaſure to eſtabliſh a *cour plenier* or ſupreme aſſembly, to be compoſed of princes of the blood, peers of the realm, great officers of the crown, the clergy, mareſchals of France, governors of provinces, knights of different orders, a deputation of one member from every parliament, and two members from the chambers of council, and to be ſummoned as often

198 Aſſembly of the Notables.

France.

often as the public emergency, in the royal opinion, ſhould render it requiſite.

If the aſſembly of the notables liſtened in ſilent deference to the project of their ſovereign, the parliament of Paris received it with every ſymptom of averſion. That body ſtrongly proteſted againſt the eſtabliſhment of any other tribunal; and declared their final reſolution not to aſſiſt at any deliberations in the ſupreme aſſembly which his majeſty prepared to inſtitute. A more unexpected mortification occurred to the king in the oppoſition of ſeveral peers of the realm: theſe expreſſed their regret at beholding the fundamental principles of the conſtitution violated; and while they were laviſh in the profeſſions of attachment to the perſon of their ſovereign, concluded with apologizing for not entering on thoſe functions aſſigned them in the plenary court, as being inconſiſtent with the true intereſts of his majeſty, which were inſeparable from thoſe of the nation.

199 Oppoſition to the king's propoſals.

The flame quickly ſpread throughout the more diſtant provinces; at Rennes in Brittany, and Grenoble in Dauphiné, the people broke out into acts of the moſt daring outrage. In the latter city ſeveral hundred of the inhabitants periſhed in a conflict with the military; they yet maintained their ground againſt the regulars; and the commanding officer, at the entreaties of the firſt preſident, readily withdrew his troops from a conteſt into which he had entered with reluctance. The different parliaments of the kingdom at the ſame time expreſſed their feelings in the moſt glowing language; and ſtrongly urged the neceſſity of calling together the ſtates general, the lawful council of the kingdom, as the only means of reſtoring the public tranquillity.

Louis now plainly ſaw, that a compliance with the public wiſhes for the re-eſtabliſhment of the ſtates general was abſolutely neceſſary, in order to avoid the calamities of a civil war, which impended upon his refuſal. In that event he muſt have expected to have encountered the majority of the people, animated by the exhortations and example of their magiſtrates; the peers of the realm had expreſſed the ſtrongeſt diſapprobation of his meaſures; nor could he even depend any longer on the ſupport of the princes of his blood: but what afforded moſt ſerious matter of alarm was the ſpirit lately diſplayed among the military, who, during the diſturbances in the provinces, had reluctantly been brought to draw their ſwords againſt their countrymen, and many of whoſe officers ſo recently engaged in eſtabliſhing the freedom of America, publicly declared their abhorrence of deſpotiſm.

It was not, however, till after many a painful ſtruggle that Louis could reſolve to reſtore an aſſembly, whoſe influence muſt naturally overſhadow that of the crown, and whoſe juriſdiction would confine within narrow limits the boundleſs power he had inherited from his predeceſſor. In the two preceding reigns the ſtates general had been wholly diſcontinued; and though the queen regent, during the troubles which attended the minority of Louis XIV. frequently expreſſed her intention of calling them together, ſhe was conſtantly diſſuaded by the repreſentations of Mazarin. It is probable that the preſent monarch ſtill flattered himſelf with the hope of being able to allure the members of that aſſembly to the ſide of the court; and having employed them to eſtabliſh ſome degree of regularity in the finances, and to curb the ſpirit of the parliament, that he would again have diſmiſſed them to obſcurity.

France.

200 Arret for ſummoning the ſtates general.

Under theſe impreſſions an arret was iſſued in Auguſt, fixing the meeting of the ſtates general to the firſt of May in the enſuing year; and every ſtep was taken to ſecure the favourable opinion of the public during the interval. New arrangements took place in the adminiſtration; and M. Neckar, whom the confidence of the people had long followed, was again introduced into the management of the finances; the torture, which by a former edict had been reſtricted in part, was now entirely aboliſhed; every perſon accuſed was allowed the aſſiſtance of counſel, and permitted to avail himſelf of any point of law; and it was decreed, that in future ſentence of death ſhould not be paſſed on any perſon, unleſs the party accuſed ſhould be pronounced guilty by a majority at leaſt of three judges.

The time appointed for the convention of the ſtates general was now approaching; and the means of aſſembling them formed a matter of difficult deliberation in the cabinet. The laſt meeting, in 1614, had been convened by application to the bailiwicks. But this mode was liable to ſeveral ſtrong objections; the bailiwicks had been increaſed in number and juriſdiction, ſeveral provinces having ſince that period been united to France; and the numbers and quality of the members were no leſs an object of ſerious attention; it was not till the cloſe of the year, therefore, that the propoſal of M. Neckar was adopted, which fixed the number of deputies at 1000 and upwards, and ordained that the repreſentatives of the third eſtate or commons ſhould equal in number thoſe of the nobility and clergy united.

The eyes of all Europe were now turned on the ſtates general; but the moment of that aſſembly's meeting was far from auſpicious: The minds of the French had long been agitated by various rumours; the unanimity that had been expected from the different orders of the ſtates was extinguiſhed by the jarring pretenſions of each; and their mutual jealouſies were attributed by the ſuſpicions of the people to the intrigues of the court, who were ſuppoſed already to repent of the haſty aſſent which had been extorted. A dearth that pervaded the kingdom increaſed the general diſcontent; and the people preſſed by hunger, and inflamed by reſentment, were ripe for revolt. The ſovereign alſo, equally impatient of the obſtacles he continually encountered, could not conceal his chagrin; while the influence of the queen in the cabinet was again eſtabliſhed, and was attended by the immediate removal of M. Neckar. The diſmiſſion of that miniſter, ſo long the favourite of the public, was the ſignal of open inſurrection: the Pariſians aſſembled in myriads; the guards refuſed to oppoſe and ſtain their arms with the blood of their fellow citizens; the Count d'Artois and the moſt obnoxious of the nobility thought themſelves happy in eluding by flight the fury of the inſurgents; and in a moment a revolution was accompliſhed, the moſt remarkable perhaps of any recorded in hiſtory.

201 Inſurrections and revolution.

But before we proceed in our narration and detail the

France. the tranſactions which have marked the progreſs of this ſingular and terrible revolution, it may be worth while to take a ſhort view of the internal ſituation of France previous to this period, and the more obvious political cauſes, the operation of which ſeems to have contributed to the production of this great event.

The moral hiſtory of man is always more important than the mere recital of any phyſical occurrences that may take place in his lot. It is not the fall of a mighty monarch and the diſperſion of his family; it is not the convulſion of empires, and the oceans of human blood which have been ſhed, that render the French revolution peculiarly intereſting. Such events, however deplorable, are far from being without example in the hiſtory of mankind. In the populous regions of the eaſt, where ſuperſtition and ſlavery have always prevailed, they are regarded as forming a part of the ordinary courſe of human affairs; becauſe an intrepid and ſkilful uſurper finds it eaſy to intimidate or enſnare millions of weak and credulous men. In Europe the caſe is very different; no adventurer can advance far without encountering thouſands as artful and as daring as himſelf. Events are not the reſult either of blind hazard or of individual ſkill; conſpiracies or plots produce little effect. Like other arts, the art of government has been brought to much perfection; and an eſtabliſhed conſtitution can only be ſhaken by the ſtrong convulſion produced by national paſſions and efforts. The wonderful ſpectacle which we are now to contemplate, is that of a mild and poliſhed people becoming in an inſtant ſanguinary and fierce; a well eſtabliſhed government, celebrated for its dexterity and ſkill, overturned almoſt without a ſtruggle; a whole nation apparently uniting to deſtroy every inſtitution which antiquity had hallowed or education taught them to reſpect; a ſuperſtitious people treating the religion of their fathers with contempt; a long-enſlaved people, whoſe very chains had become dear to them, occupied in their public councils in the diſcuſſion of refined and even viſionary ſchemes of freedom: in ſhort, 25,000,000 of perſons ſuddenly treading under foot every ſentiment and every prejudice that they themſelves had once regarded as ſacred and venerable.

202 France formerly under a barbarous ariſtocracy. Like the other nations of Europe, France was anciently governed by a barbarous ariſtocracy, whoſe different members were feebly united by the authority of a ſucceſſion of kings deſtitute of power or influence. The nobles, within their own territories, enjoyed privileges entirely royal: they made peace and war; they coined money; they were judges in the laſt reſort; their vaſſals were their ſlaves, whom they brought and ſold along with the lands; the inhabitants of cities, although freemen, were depreſſed and poor, depending for protection upon ſome tyrannical baron in their neighbourhood. At length, however, by the progreſs of the arts, the cities roſe into conſiderable importance, and their inhabitants, along with ſuch freemen of low rank as reſided in the country, were conſidered as entitled to a repreſentation in the ſtates-general of the kingdom, under the appellation of *tiers etat*, or *third eſtate;* the clergy and the nobles forming the two firſt eſtates. But the ſovereign, having ſpeedily become deſpotic, the meetings of the ſtates-general were laid aſide. This abſolute authority, on the part of the crown, was not acquired, as it was in England by the houſe of Tudor, by aboliſhing the pernicious privileges of the nobles and elevating the commons; but by ſkilful encroachments, by daring exertions of prerogative, and the uſe of a powerful military force. In France, therefore, the monarch was abſolute, yet the nobles retained all their feudal privileges, and the eccleſiaſtical hierarchy did the ſame. The following was, in a few words, the ſtate of that country during theſe two laſt centuries. France.

203 Was never reduced into one homogeneous maſs. The kingdom of France, previous to the revolution, was never reduced to one homogeneous maſs. It conſiſted of a variety of ſeparate provinces acquired by different means; ſome by marriage, ſome by legacy, and others by conqueſt. Each province retained its ancient laws and privileges, whether political or civil, as expreſſed in their capitularies or conditions by which they were originally acquired. In one part of his dominions the French monarch was a count, in another he was a duke, and in others he was a king; the only bond which united his vaſt empire being the ſtrong military force by which it was overawed. Each province had its barriers; and the intercourſe betwixt one province and another was often more reſtrained by local uſages than the intercourſe of either with a foreign country. Some of the provinces, ſuch as Bretagne and Dauphiné, even retained the right of aſſembling periodically their provincial ſtates; but theſe formed no barrier againſt the power of the court.

204 The clergy formed the firſt eſtate in the kingdom. The clergy formed the firſt eſtate in point of precedence. They amounted to 130,000. The higher orders of them enjoyed immenſe revenues; but the *curés* or great body of acting clergy ſeldom poſſeſſed more than about 28l. ſterling a year, and their *vicaires* about half that ſum. A few of their dignified clergy were men of great piety, who reſided conſtantly in their dioceſes, and attended to the duties of their office; but by far the greater number of them paſſed their lives at Paris and Verſailles, immerſed in all the intrigues and diſſipation of a gay and corrupted court and capital. They were almoſt excluſively ſelected from among the younger branches of the families of the moſt powerful nobility, and accounted it a kind of diſhonour to the order of biſhops for any perſons of low rank to be admitted into it. The lower clergy, on the contrary, were perſons of mean birth, and had little chance of preferment. At the ſame time, we find ſeveral reſpectable exceptions to this laſt rule. The clergy, as a body, independent of the tithes, poſſeſſed a revenue ariſing from their property in land, amounting to four or five millions ſterling annually; at the ſame time they were exempt from taxation. The crown had of late years attempted to break through this privilege. To avoid the danger, the clergy preſented to the court a free gift of a ſum of money ſomewhat ſhort of a million ſterling every five years.

205 The nobility the ſecond. The nobility was nominally the ſecond order of the ſtate, but it was in reality the firſt. The nobles amounted to no leſs than 200,000 in number. The title and rank deſcended to all the children of the family, but the property to the eldeſt alone: hence vaſt multitudes of them were dependent upon the bounty of the court. They regarded the uſeful and commercial arts as diſhonourable, and even the liberal profeſſions of the law and phyſic as in a great meaſure beneath their dignity, diſ-

daining

France. daining to intermarry with the families of their profeſſors. The feudal ſyſtem in its purity was extremely favourable to the production of reſpectable qualities in the minds of thoſe who belonged to the order of the nobles; but the introduction of commerce has rendered its decline equally unfavourable to that claſs of men. Inſtead of the ancient patriarchal attachment between the feudal chieftain and his vaſſals, the nobility had become greedy landlords in the provinces, that they might appear in ſplendor at court and in the capital. There, loſt in intrigue, ſenſuality, and vanity, their characters became frivolous and contemptible. Such of the French nobleſſe, however, as remained in the provinces, regarded with indignation this degradation of their order, and ſtill retained a proud ſenſe of honour and of courage, which has always rendered them reſpectable. The order of the nobles was exempted from the payment of taxes, although the property of ſome of them was immenſe. The eſtates of the prince of Conde, for example, were worth 200,000l. a-year, and thoſe of the duke of Orleans nearly twice as much. The crown had indeed impoſed ſome trifling taxes upon the nobleſſe, which, however, they in a great meaſure contrived to elude.

206 The parliament the third.

Next to the nobles, and as a privileged order poſſeſſing a ſecondary kind of nobility of their own, we may mention the parliaments. Theſe were large bodies of men, in different provinces, appointed as courts of law for the adminiſtration of juſtice. In conſequence of the corruption of the officers of ſtate, the members purchaſed their places, which they held for life; but the ſon was uſually preferred when he offered to purchaſe his father's place. In conſequence of this laſt circumſtance, the practiſing lawyers had little chance of ever becoming judges. Courts thus conſtituted conſiſted of a motley mixture of old and young, learned and ignorant, men. Juſtice was ill adminiſtered. The judges allowed their votes in depending cauſes to be openly ſolicited by the parties or their friends. No wiſe man ever entered into a litigation againſt a member of one of theſe parliaments; no lawyer would undertake to plead his cauſe; it never came to a ſucceſsful iſſue, and uſually never came to any iſſue at all. After the ſtates-general had fallen into diſuſe, the parliaments acquired a certain degree of political conſequence, and formed the only check upon the abſolute power of the crown. The laws, or royal edicts, before being put in force, were always ſent to be regiſtered in the books of the parliaments. Taking advantage of this, in favourable times and circumſtances, they often delayed or refuſed to regiſter the royal edicts, and preſented remonſtrances againſt them. This was done under a kind of legal fiction: for they pretended that the obnoxious edict being injurious to the public happineſs, could not be the will of the king, but muſt either be a forgery or an impoſition by the miniſters. Theſe objections were got the better of, either by a poſitive order from the king, or by his coming in perſon and ordering the edict to be regiſtered. The parliaments, however, often carried their oppoſition very far, even to the ruin of themſelves and their families as individuals. This rendered them extremely popular with the nation, and enabled them to embarraſs a weak adminiſtration. After all, however, the oppoſition of the parliaments was ſo feeble, that it was never thought worth while to aboliſh them entirely till towards the end of the reign of Louis XV.; but they were reſtored as a popular meaſure, at the beginning of the reign of Louis XVI. France.

207 The commons the loweſt order.

The *tiers etat*, or commons, formed the loweſt order of the ſtate in France, and they were depreſſed and miſerable in the extreme. To form a conception of their ſituation, it is neceſſary to obſerve that they bore the whole pecuniary burdens of the ſtate: They alone were liable to taxation. An expenſive and ambitious court; an army of 200,000 men in time of peace, and of twice that number in war; a conſiderable marine eſtabliſhment, public roads and works, were all ſupported excluſively by the loweſt of the people. To add to the evil, the revenues were ill collected. They were let out to farmers-general at a certain ſum, over and above which they not only acquired immenſe fortunes to themſelves, but were enabled to advance enormous preſents to thoſe favourites or miſtreſſes of the king or the miniſter, by means of whom they procured their places. To raiſe all this money from the people, they were guilty of the cruelleſt oppreſſion, having it in their power to obtain whatever revenue laws they pleaſed, and executing them in the ſevereſt manner. For this laſt purpoſe they kept in pay an army of clerks, ſubalterns, ſcouts, and ſpies, amounting to 80,000 men. Theſe men were indeed deteſted by the king, whom they deceived and kept in poverty; by the people, whom they oppreſſed; and by the ancient nobility, as purſe-proud upſtarts. But the court of France could never contrive to manage without them. The peaſants could be called out by the intendants of the provinces, in what they called *corvées*, to work upon the high roads for a certain number of days in the year, which was a ſource of ſevere oppreſſion, as the intendant had the choice of the time and place of their employment, and was not bound to accept of any commutation in money. They were moreover ſubject to the nobles in a thouſand ways. The nobles retained all their ancient manorial or patrimonial juriſdictions. The common people being anciently ſlaves, had obtained their freedom upon different conditions. In many places they and their poſterity remained bound to pay a perpetual tribute to their feudal lords. Such tributes formed a conſiderable part of the revenue of many of the provincial nobles. No man could be an officer of the army, by a late regulation, who did not produce proofs of nobility for four generations. The parliaments, although originally of the *tiers etat*, attempted alſo to introduce a rule that none but the nobleſſe ſhould be admitted into their order. In ſuch a ſituation, it will not be accounted ſurpriſing that the common people of France were extremely ſuperſtitious and ignorant. They were, however, paſſionately devoted to their monarch, and whatever concerned him. In 1754, when Louis XV. was taken ill at Metz, the whole nation was truly in a kind of deſpair. The courier and his horſe that brought the news of his recovery to Paris were both almoſt ſuffocated by the embraces of the people.

Oppreſſive burdens on them.

208 Deſpotic power of the king.

We have ſaid that the French monarch was deſpotic. His power was ſupported by his army, and by a watchful police, having in pay an infinite hoſt of ſpies and other ſervants. In France no man was ſafe. The ſecrets of private families were ſearched into. Nothing

was

France. was unknown to the jealous inquiſition of the police. Men were ſeized by *lettres de cachet* when they leaſt expected it, and their families had no means of diſcovering their fate. The ſentence of a court of law againſt a nobleman was uſually reverſed by the miniſter. No book was publiſhed without the licenſe of a cenſor-general appointed by the court, and the miniſter was accountable to none but the king. No account was given of the expenditure of the public money. Enormous gratifications and penſions were given as the reward of the moſt infamous ſervices. The ſupreme power of the ſtate was uſually lodged with a favourite miſtreſs, and ſhe was ſometimes a woman taken from publie proſtitution. This was not indeed the caſe under Louis XVI. but it was nevertheleſs one of the misfortunes of his life that he was far from being abſolute in his own family. Still, however, with all its faults, the French court was the moſt ſplendid and poliſhed in Europe. It was more the reſort of men of talents and literature of every kind, and there they met with more ample protection, than anywhere elſe. The court was often jealous of their productions, but they met with the moſt diſtinguiſhed attention from men of fortune and rank; inſomuch that for a century paſt the French have given the law to Europe in all queſtions of taſte, of literature, and of every polite accompliſhment. The gay elegance that prevailed at court diffuſed itſelf through the nation; and amidſt much internal miſery, gave it to a foreigner the appearance of happineſs, or at leaſt of levity and vanity.

209 Splendour of the court &c.

Such as it was, this government had ſtood for ages, and might have continued, had not a concurrence of cauſes contributed to its overthrow. The inferior orders of clergy, excluded from all chance of preferment, regarded their ſuperiors with jealouſy and envy, and were ready to join the laity of their own rank in any popular commotion. The inferior provincial nobleſſe beheld with contempt and indignation the vices and the power of the courtiers, and the higher nobility wiſhed to diminiſh the power of the crown. The practiſing lawyers, almoſt entirely excluded from the chance of becoming judges, wiſhed eagerly for a change of affairs, not doubting that their talents and profeſſional ſkill would render them neceſſary amidſt any alterations that could occur. Accordingly, they were the firſt inſtruments in producing the revolution, and have been its moſt active ſupporters. The monied intereſt wiſhed eagerly for the downfal of the ancient nobility. As for the great maſs of the common people, they were too ignorant, too ſuperſtitiouſly attached to old eſtabliſhments, and too much depreſſed, to have any conception of the nature of political liberty, or any hope of obtaining it. We have already ſtated the leading circumſtances which led to the French revolution (ſee N° 184, &c.); but there were other circumſtances which contributed in an equal degree both to its commencement and its progreſs.

210 Cauſes of the Revolution.

For 40 years the principles of liberty had been diſſeminated with eagerneſs in France by ſome men of great talents, as Rouſſeau, Helvetius, and Raynal, to whom the celebrated Monteſquieu had led the way. Beſides theſe, there was in France a vaſt multitude of what were called *men of letters*, or perſons who gave this account of the manner in which they ſpent their time. All theſe were deeply engaged on the ſide of ſome kind of political reform. The men of letters in Paris alone are ſaid to have amounted to 20,000. One of the laſt acts of the adminiſtration of the archbiſhop of Thouloufe was, on the 5th July 1788, to publiſh a reſolution of the king in council, inviting all his ſubjects to give him their advice with regard to the ſtate of affairs. This was conſidered as a conceſſion of an unlimited liberty of the preſs; and it is ſcarcely poſſible to form an idea of the infinite variety of political publications which from that period diffuſed among the people a diſſatisfaction with the order of things in which they had hitherto lived. France.

The eſtabliſhed religion of France had for ſome time paſt been gradually undermined. It had been ſolemnly aſſaulted by philoſophers in various elaborate performances; and men of wit, among whom Voltaire took the lead, had attacked it with the dangerous weapon of ridicule. The Roman Catholic religion is much expoſed in this reſpect, in conſequence of the multitude of falſe miracles and legendary tales with which its hiſtory abounds. Without diſcriminating betwixt the reſpectable principles on which it reſts, and the ſuperſtitious follies by which they had been defaced, the French nation learned to laugh at the whole, and rejected inſtead of reforming the religion of their fathers. Thus the firſt order in the ſtate had already begun to be regarded as uſeleſs, and the minds of men were prepared for important changes.

The immenſe population of the city of Paris, amounting to upwards of 800,000 ſouls, rendered it an important engine in the hands of the conductors of the revolution. An overgrown capital has always proved dangerous to a government that is or attempts to be deſpotic, as appears from the hiſtory of ancient Babylon and Rome, as well as of modern Conſtantinople, of London under Charles I. and Paris under ſeveral of its kings.

We cannot here avoid mentioning a phyſical event, which aſſiſted not a little in producing many of the convulſions attending the revolution, a general ſcarcity of grain, which occurred about that period. On Sunday the 13th of July 1788, about nine in the morning, without any eclipſe, a dreadful darkneſs ſuddenly overſpread ſeveral parts of France. It was the prelude of ſuch a tempeſt as is unexampled in the temperate climates of Europe. Wind, rain, hail, and thunder, ſeemed to contend in impetuoſity; but the hail was the great inſtrument of ruin. Inſtead of the rich proſpects of an early autumn, the face of nature in the ſpace of an hour preſented the dreary aſpect of univerſal winter. The ſoil was converted into a moraſs, the ſtanding corn beaten into the quagmire, the vines broken to pieces, the fruit trees demoliſhed, and unmelted hail lying in heaps like rocks of ſolid ice. Even the robuſt foreſt trees were unable to withſtand the fury of the tempeſt. The hail was compoſed of enormous, ſolid, and angular pieces of ice, ſome of them weighing from eight to ten ounces. The country people, beaten down in the fields on their way to church, amidſt this concuſſion of the elements, concluded that the laſt day was arrived; and ſcarcely attempting to extricate themſelves,

France. themſelves, lay deſpairing and half ſuffocated amidſt the water and the mud, expecting the immediate diſſolution of all things. The ſtorm was irregular in its devaſtations. While ſeveral rich diſtricts were laid entirely waſte, ſome intermediate portions of country were comparatively little injured. One of 60 ſquare leagues had not a ſingle ear of corn or fruit of any kind left. Of the 66 pariſhes in the diſtrict of Pontoiſe, 43 were entirely deſolated, and of the remaining 23 ſome loſt two-thirds and others half their harveſt. The Iſle of France, being the diſtrict in which Paris is ſituated, and the Orleannois, appear to have ſuffered chiefly. The damage there, upon a moderate eſtimate, amounted to 80,000,000 of livres, or between three and four millions ſterling. Such a calamity muſt at any period have been ſeverely felt; but occurring on the eve of a great political revolution, and amidſt a general ſcarcity throughout Europe, it was peculiarly unfortunate, and gave more embarraſſment to the government than perhaps any other event whatever. Numbers of families found it neceſſary to contract their mode of living for a time, and to diſmiſs their ſervants, who were thus left deſtitute of bread. Added to the public diſcontent and political diſſenſions, it produced ſuch an effect upon the people in general, that the nation ſeemed to have changed its character; and inſtead of that levity by which it had ever been diſtinguiſhed, a ſettled gloom now ſeemed fixed on every countenance.

211 Attempt to reduce the power of the crown in ſpring 1789.

The ſpring of the year 1789 was a period of much political anxiety in France. The ſuperior orders wiſhed to reduce the power of the crown, but were jealous of their own privileges, and determined to retain them; while the popular philoſophers and others were endeavouring to render them odious, and to rouſe the people to a love of freedom. Still, however, the great body of the common people remained careleſs ſpectators of the ſtruggle, and unconſcious of the approaching commotion. Such was their indifference, that few of them took the trouble even to attend and vote at the elections of the deputies to the ſtates-general. In many places, where a thouſand voters were expected, not fifty came forward; but ſuch of them as did appear ſhowed that a ſeed was ſown which might one day riſe into important fruits. In the inſtructions which they gave to their deputies, the Britiſh conſtitution was in general the model of what they wiſhed their government to be. They demanded equal taxation, the abolition of *lettres de cachet* or arbitrary impriſonment, the reſponſibility of miniſters, and the extinction of the feudal privileges of the nobles; but they wiſhed that the whole three orders of the ſtate ſhould ſit and vote in one houſe, well knowing that their nobility were not prepared to act the moderate part of a Britiſh houſe of lords. The nobles, on the contrary, although willing to renounce ſome of their pecuniary privileges, and to ſacrifice the power of the crown, were moſt deciſively reſolved neither to ſurrender their feudal prerogatives nor the right of ſitting in three ſeparate aſſemblies; by means of which each of the orders could eaſily reſiſt the encroachments of the other two. M. Neckar has been improperly cenſured for not deciding this laſt important queſtion previous to the meeting of the ſtates-general: but it muſt be obſerved, that the very purpoſe of calling that aſſembly was to overturn the unjuſt privileges of the higher orders through its medium, and without any direct interpoſition on the part of the miniſters. Had the king poſitively decided in favour of three chambers, the nobles and the clergy would have retained all thoſe ancient abuſes eſtabliſhed in their own favour, of which it was his wiſh to deprive them, and the crown and its prerogatives would have been the only objects of ſacrifice. It was therefore thought ſafer to leave the *tiers etat* to fight its own battle; nor was it yet imagined that the commons of France, depreſſed and poor, and diſperſed by ſituation over a multitude of provinces, could ever unite in enterpriſes dangerous to the ſovereign. France.

212 States ſummoned to meet at Verſailles.

The ſtates had been ſummoned to meet at Verſailles on the 27th of April, and moſt of the deputies arrived at that time; but the elections for the city of Paris not being concluded, the king deferred the commencement of their ſeſſions till the 4th of May. During this period, the members, left in idleneſs, began to find out and form acquaintance with each other. Among others, a few members from Brittany (Bretagne) formed themſelves into a club, into which they gradually admitted many other deputies that were found to be zealous for the popular cauſe, and alſo many perſons who were not deputies. This ſociety, thus originally eſtabliſhed at Verſailles, was called the *Comité Breton;* and was one day deſtined, under the appellation of the *Jacobin Club*, to give laws to France, and to diffuſe terror and alarm throughout Europe. On the other ſide, the ariſtocratic party eſtabliſhed conferences at the houſe of Madame Polignac, for the purpoſe, it is ſaid, of uniting the nobles and the clergy.

213 A popular riot in the ſuburb of St Antoine.

An event occurred at this time which all parties aſcribed to ſome malicious motive. In the populous ſuburb of St Antoine, a M. Reveillon carried on a great paper manufactory. A falſe report was ſpread that he intended to lower the wages of his workmen, and that he had declared bread was too good for them, and that they might ſubſiſt very well on potato-flour. A commotion was raiſed, he was burnt in effigy, and his houſe was thereafter burnt and pillaged by the mob, who were not diſperſed till the military had been called in, and much carnage enſued. The popular party aſſerted that the commotion had been artfully excited by the party of the queen and the Count D'Artois, to afford a pretence for bringing great bodies of the military to the neighbourhood to overawe the ſtates-general, or induce the king more deciſively to reſolve on aſſembling that body at Verſailles, in preference to Paris, where they and the popular miniſter M. Neckar wiſhed it to be held.

214 The States General commence buſineſs at Verſailles.

On the 4th of May the ſtates general aſſembled at Verſailles. They commenced buſineſs by going in a ſolemn proceſſion, preceded by the clergy, and followed by the king, according to ancient cuſtom, to church, to perform an act of devotion. The nobles were arrayed in a ſplendid robe, and they and the higher clergy glittered in gold and jewels. The commons appeared in black, the dreſs belonging to the law. The aſſembly was thereafter opened by a ſhort

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short speech from the throne, in which the king congratulated himself on thus meeting his people assembled; alluded to the national debt, and the taxes, which were severely felt because unequally levied; he took notice of the general discontent and spirit of innovation which prevailed, but declared his confidence in the wisdom of the assembly for remedying every evil. "May an happy union (added he) reign in this assembly; and may this epocha become ever memorable for the happiness and prosperity of the country. It is the wish of my heart; it is the most ardent desire of my prayers; it is, in short, the price which I expect from the sincerity of my intentions and my love for my people."

M. Barretin, the keeper of the seals, next addressed the assembly in a congratulatory and uninteresting speech. He was followed by the popular minister M. Neckar, who spoke for three hours. Though much applauded on account of the clear financial details which his speech contained, he encountered a certain degree of censure from all parties, on account of the cautious ambiguity which he observed with regard to the future proceedings of the states-general.

215 Their debates and inactivity.

Next day the three orders assembled separately. The deputies of the *tiers etat* amounted to 600 in number, and those of the nobles and clergy to 300 each. During their first sittings much time was spent in unimportant debates about trifling points of form; but the first important question, that necessarily became the subject of their discussion, was the *verification of their powers*, or production of the commissions of the members, and investigation of their authenticity. The commons (*tiers etat*) laid hold of this as a pretext for opening the grand controversy, whether the states-general should sit in one or in three separate chambers? They sent a deputation inviting the nobles and the clergy to meet along with them in the common hall for the purpose of *verifying their powers* in one common assembly. In the chamber of the clergy 114 members voted for the performance of this ceremony in the general assembly; and 133 against it. But in the more haughty order of the nobles, the resolution for the verification in their own assembly was carried by a majority of 188 against 47. The commons paid no regard to this. They were conducted by bold and skilful leaders, who discerned the importance of the point in contest, and resolved not to abandon it. Aware of the exigencies of the state, they knew that the crown was nearly verging upon bankruptcy; and that such were the deficiencies of the revenue, that only a short delay was necessary to accomplish the absolute dissolution of the government. They suffered five weeks to pass away therefore in total inactivity. During this period proposals were made on the part of the ministry for a pacification between the three orders, and conferences were opened by commissioners from each. But no art could seduce the commons from their original purpose, or prevail with them to enter upon the business of the state.

216 ppularity the *iers Etat*, t commons.

The nation had expected much from the assembling of the states-general, and learnt the news of their inaction with no small degree of concern. The *tiers etat* was naturally popular, and the public censure could not readily devolve upon that favourite order.

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Moreover, from the first period of their assembling the commons made every effort to augment their own natural popularity. They admitted all persons promiscuously into the galleries, and even into the body of their hall. No restraint was attempted to be laid upon the most vehement marks of popular applause or censure. Lists of the voters names were publicly taken and sent to Paris upon every remarkable occasion; and the members suddenly found themselves become, according to their political sentiments, the objects of general execration or applause. The new and bold notions of liberty that were daily advanced by the leaders of the *tiers etat* were received with acclamation by their hearers. The capital became interested in the issue of every debate; and the political fervor was eagerly imbibed by the nation with that vivacity which is so peculiar to the French. The commons accused the nobles of obstinately impeding the business of the state, by refusing to verify their powers in one common assembly. The accusation was swallowed by the multitude, who saw not, or were unwilling to see, that the attack was made by their own favourite order. In the mean time the nobles became rapidly more and more unpopular. Their persons were insulted, new publications daily came forth, and were greedily bought up, which reviled their whole order, and represented them as an useless or pernicious body of men, whose existence ought not to be tolerated in a free state. Whoever adhered to them was branded with the odious appellation of *Aristocrat*. The clergy, from the influence of the parish *curés* or persons, seemed ready to desert their cause. They were even opposed by a minority of their own body, which derived lustre from having at its head the duke of Orleans the first prince of the blood. Still, however, the majority of the nobles remained firm; well aware, that if they once consented to sit in the same assembly, and to vote promiscuously, with the ambitious and more numerous body of the commons, their whole order, and all its splendid privileges must speedily be overthrown.

217 Taking advantage of this popularity, they seize the legislative authority;

The leaders of the commons saw the change that was taking place in the minds of men; and they at length regarded the period as arrived when they ought to emerge from their inactivity, and execute the daring project of seizing the legislative authority in their country. They declared that the representatives of the nobles and the clergy were only the deputies of particular incorporations whom they would allow to sit and vote along with themselves; but who had no title in a collective capacity to act as the legislators of France. For conducting business with more facility, they appointed 20 committees. In consequence of a proposal by the Abbe Sieyes, a final message was sent to the privileged orders, requiring their attendance as individuals, and intimating that the commons, as the deputies of 96 out of every hundred of their countrymen, were about to assume the exclusive power of legislation. None of the nobles obeyed this summons; but three curés, Messrs Cesve, Ballard, and Jallot, presented their commissions, and were received with loud acclamations. They were next day followed by five more, among whom were Messrs Gregoire, Dillon, and Bodineau. After some debate concerning the appellation which they ought to assume, the commons, with

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such of the clergy as had joined them, solemnly voted themselves the sovereign legislators of their country under the name of the *National Assembly*. The result of the vote was no sooner declared, than the hall resounded with shouts from the immense concourse of spectators, of "Vive le roi et vive l'assemblée nationale," *Long live the king and the national assembly*. M. Bailly was chosen president for four days only, Messrs Camus and Pison de Galand secretaries, and the assembly proceeded to business.

218 and assert their own sovereignty.

Its first acts were decisively expressive of its own sovereignty. All taxes imposed without the consent of the representatives of the people were declared to be null and void; but a temporary sanction was given to the present taxes, although illegal, till the dissolution of the assembly, and no longer. It was added, that "as soon as, in concert with his majesty, the assembly should be able to fix the principles of national regeneration, it would take into consideration the *national debt*, placing, from the present moment, the creditors of the state under the safeguard and honour of the French nation."

219 Majority of the clergy unite with them.

The popular cause now gained ground so fast, that on the 19th of June a majority of the clergy voted for the verification of their powers in common with the national assembly, and they resolved to unite with them on the following day.

220 Fears of the nobles.

Affairs were now come to a crisis, and the nobles perceived that they must instantly make a decisive stand, or yield up their cause as finally lost. Such was their alarm, that M. d'Espremenil proposed, at one of the sittings of their order, to address the king, intreating him to dissolve the states-general. Hitherto that prince had gone along with M. Neckar in favouring the popular cause in opposition to the aristocracy. But every art was now used to alarm his mind upon the subject of the late assumptions of power on the part of the commons, and these arts were at length successful. Repeated counsels were held; M. Neckar was absent attending a dying sister, and the king was prevailed upon to act agreeably to the advice of the leaders of the nobles. But the first measure which they adopted was so ill conducted as to afford little prospect of final success to their cause. On the 20th of June, when the president and members were about to enter as usual into their own hall, they found it unexpectedly surrounded by a detachment of the guards, who refused them admission, while the heralds at the same time proclaimed a royal session. Alarmed by this unforeseen event, the meaning of which they knew not, but apprehending that an immediate dissolution of the assembly was designed, they instantly retired to a neighbouring tennis court, where, in the vehemence of their enthusiasm, they took a solemn oath "never to separate till the constitution of their country should be completed."

221 Royal session proclaimed.

On the 22d a new proclamation intimated that the royal session was deferred till the following day. It was now found that the assembly had been excluded from their hall merely because the workmen were occupied in preparing it for the intended solemnity. This information was ill calculated to excite favourable expectations of the measures about to be adopted at a royal session, ushered in by such circumstances of marked disrespect for the representatives of the people. The assembly, after wandering about in search of a place of meeting, at length entered the church of St Louis, and were immediately joined by the majority of the clergy, with their president, the archbishop of Vienne, at their head. Two nobles of Dauphiné, the marquis de Blaçon and the count d'Agoult, presented their commissions at the same time. Encouraged by these events, and by the applauses of surrounding multitudes, the assembly now expected with firmness the measures about to be adopted.

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222 The Assembly meets in the church of St Louis.

223 Discourse of the king.

The royal session was held in the most splendid form, but altogether in the style of the ancient despotism. Soldiers surrounded the hall. The two superior orders were seated, while the representatives of the people, left standing a full hour in the rain, were in no humour, when at last admitted, to receive with much complacency the commands of their sovereign. The king read a discourse, in which he declared null and void the resolutions of the 17th, but at the same time presented the plan of a constitution for France. It contained many good and patriotic principles, but preserved the distinction of orders, and the exercise of *lettres de cachet;* it said nothing about any active share in the legislative power to be possessed by the states-general, and was silent both about the responsibility of ministers and the liberty of the press. The king concluded by commanding the deputies immediately to retire, and to assemble again on the following day. He then withdrew, and was followed by all the nobles and a part of the clergy. The commons remained in gloomy silence on their seats. It was interrupted by the grand master of the ceremonies, who reminded the president of the intentions of the king. Instantly the vehement count de Mirabeau, starting from his seat, exclaimed with indignation, "The commons of France have determined to debate. We have heard the intentions that have been suggested to the king; and you, who cannot be his agent with the states-general, you who have here neither seat nor voice, nor a right to speak, are not the person to remind us of his speech. Go tell your master, that we are here by the power of the people, and that nothing shall expel us but the bayonet." The applause of the assembly seconded the enthusiasm of the orator, and the master of the ceremonies withdrew in silence.

224 Ill received by the commons.

225 Debates after the king's departure.

M. Camus then rose; and in a violent speech indignantly stigmatized the royal session by the obnoxious appellation of a *bed of justice;* he concluded by moving that the assembly should declare their unqualified adherence to their former decrees. This motion was followed by another, pronouncing the persons of the deputies inviolable. Both were supported by Messrs Petion, Barnave, Glaizen, the Abbes Gregoire, Sieyes, and many others, and were unanimously decreed. The assembly therefore continued their sittings in the usual form. On the following day the majority of the clergy attended as members; and on the 25th the duke of Orleans, along with 49 of the deputies belonging to the order of nobles, joined them also. The remaining nobles, as well as the small minority of the clergy, now found themselves awkwardly situated. Whether on this account, or because their leaders had by this time formed a plan for carrying their point not by peaceable means but by the aid of a military force, the king, on the 27th, invited by a pressing letter both orders to

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to join the commons. This requeſt was immediately complied with, although many of the nobility diſapproved of the meaſure.

226 Alarming ſituation of France at this period.

The ſituation of France was now become truly alarming. When the king retired from the aſſembly after the royal ſeſſion, he was followed by more than 6000 citizens, from whom loud clamours and every mark of diſapprobation broke forth. All Verſailles was ſpeedily in an uproar. M. Neckar had repeatedly ſolicited his diſmiſſion, and the report of this had increaſed the popular clamour. The court was in conſternation. The king probably diſcovered, with no great ſatisfaction, that his miniſter was more popular than himſelf. At ſix o'clock in the evening the queen ſent for M. Neckar. When he returned from the palace, he aſſured the crowd that waited for him that he would not abandon them; upon which they retired ſatisfied. At the ſame time the news of the royal ſeſſion had thrown the city of Paris into violent agitation. The peace of that capital was at this time endangered by a variety of cauſes. A dreadful famine raged through the land, which in a great city is uſually moſt ſeverely felt. This prepared the minds of men for receiving unfavourable impreſſions of their political ſtate. Every effort was moreover made to diſorganize the government, and produce a diſlike to the ancient order of things. The preſs poured forth innumerable publications, filled with new and ſeducing, though generally impracticable, theories of liberty. Theſe were diſtributed *gratis* among the bulk of the people of Paris, and diſperſed in the ſame manner through the provinces. Philip duke of Orleans (preſumptive heir to the crown, failing the children and brothers of the king) is with good reaſon believed to have ſupplied this expence out of his more than royal revenues. In the gardens of the Palais Royal at Paris, which belonged to him, an immenſe multitude was daily aſſembled, liſtening from morning to night to orators who deſcanted upon the moſt violent ſubjects of popular politics. Many of theſe orators were ſuſpected to be in his pay. It was even believed that his money found its way into the pockets of ſome of the moſt diſtinguiſhed leaders in the national aſſembly.

227 Numerous ſeditious publications.

228 Seduction of the military.

But the government was, if poſſible, ſtill more dangerouſly aſſaulted by the methods now generally uſed to ſeduce the military. Every officer of the French army belonged to the order of the nobles; and from that quarter, therefore, it might have been imagined that there was little danger. But this very circumſtance became the means of diſorganizing that great engine of deſpotiſm. As the ſoldiers could not avoid imbibing ſome of the new opinions, their own officers became the firſt objects of their jealouſy; eſpecially in conſequence of that impolitic edict of Louis XVI. which required every officer to produce proofs of four degrees of nobility; and thus inſulted, by avowedly excluding the private men from promotion. Perhaps with a view to what might happen, the inſtructions to the deputies of the *tiers etat* had recommended an increaſe of the pay of the ſoldiers. And now at Paris every art was uſed to gain them to the popular cauſe. They were conducted to the Palais Royal, and were there careſſed and flattered by the populace, while they liſtened to the popular harangues. Theſe arts were ſucceſsful. On the 23d of June they firſt refuſed to fire on the mob in a riot. Some of them were on the 30th reported to be in confinement for this offence; a crowd inſtantly collected, and reſcued them, the dragoons that were brought to ſuppreſs the tumult grounding their arms. A deputation of the citizens ſolicited of the aſſembly the pardon of the priſoners. The aſſembly applied to the king, who pardoned them accordingly.

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All theſe events, together with the tumultuous ſtate of the capital, which was daily increaſing, made it neceſſary for the king to call out the military force to reſtore, if poſſible, the public peace. That his intentions were pure, the then ſtate of affairs will permit no man but a democrat to doubt; but the ariſtocracy, with the Count d'Artois at their head, were bringing forward other meaſures, which ultimately contributed to the ruin of themſelves, the king, and the kingdom. Crowds of ſoldiers were collected from all parts of the kingdom around Paris and Verſailles. It was obſerved, that theſe conſiſted chiefly of foreign mercenaries. Camps were traced out. Marſhal Broglio, a tried veteran, was ſent for and placed at the head of the army. The king was ſuppoſed to have entirely yielded to new counſels, and every thing bore the appearance of a deſperate effort to reſtore the energy of the ancient government. This is the moſt important period of the French revolution; yet the ſpecific deſigns of the leading actors have never been clearly underſtood. It was rumoured at the time, that Paris was to be ſubdued by a ſiege and bombardment; that the aſſembly was to be diſſolved, and its leaders put to death. Theſe are incredible exaggerations; but the criſis of French liberty was univerſally regarded as at hand, and alſo the exiſtence of the national aſſembly as an independent body; or at leaſt upon any other footing than that propoſed by the king on the 23d of June.

229 The military called out.

An able and eloquent addreſs to the king againſt the aſſemblage of foreign troops in their neighbourhood was brought forward by Mirabeau, and voted by the aſſembly. The king properly replied, that the ſtate of the capital was the cauſe of aſſembling the troops, and offered to transfer the ſtates-general to Noyons or Soiſſons. "We will neither remove (exclaimed Mirabeau) to Noyons or to Soiſſons; we will not place ourſelves between two hoſtile armies, that which is beſieging Paris, and that which may fall upon us through Flanders or Alſace; we have not aſked permiſſion to run away from the troops; we have deſired that the troops ſhould be removed from the capital."

230 The aſſembly addreſs the king to remove them, which is refuſed.

Thirty-five thouſand men were now ſtationed in the neighbourhood of Paris and Verſailles. The poſts were occupied which commanded the city, and camps were marked out for a greater force. The Count d'Artois and his party regarded their plans as ripe for execution; and M. Neckar received a letter from the king, requiring him to quit the kingdom in 24 hours. That popular miniſter took the route of Bruſſels on the following day, when his departure was made public. In his diſmiſſion the popular, or, as it was now called, the *democratic*, party thought they ſaw the reſolution adopted to accompliſh their ruin. The aſſembly again addreſſed the throne; they requeſted anew the removal of the troops, offering to be reſponſible for the public peace, and to proceed in a body to Paris to encoun-

231 They again addreſs the king;

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ter perſonally every danger that might occur. But they were coolly told, that the king was the beſt judge of the mode of employing the troops, and that the preſence of the aſſembly was neceſſary at Verſailles. From a ſovereign who doubtleſs recollected the proceedings of the long parliament of England, a different reply could not in reaſon be expected. On receiving it, however, it was inſtantly decreed, on the motion of the marquis de la Fayette, that the late miniſtry had *carried with them* the confidence of the aſſembly; that the troops *ought* to be *removed*; that the miniſtry are and ſhall be reſponſible to the people for their conduct; that the aſſembly perſiſted in all its former decrees; and that as it had taken the public debt under the protection of the nation, no power in France was entitled to pronounce the infamous word *bankruptcy*.

232 and are again refuſed.

233 Decree of the aſſembly in conſequence.

234 Conſternation in Paris on Neckar's retreat.

The city of Paris was thrown into deep conſternation by the news of M. Neckar's retreat. His buſt and that of the duke d'Orleans were dreſſed in mourning, and carried through the ſtreets. The royal Allemand, a German regiment, broke in pieces the buſts, and diſperſed the populace. The prince de Lambeſq, grand ecuyer of France, was ordered to advance with his regiment of cavalry, and take poſt at the Thuilleries. Being a man of a violent temper, and enraged by the appearances of diſapprobation which were viſible around him, he furiouſly cut down with his ſword a poor old man who was walking peaceably in the gardens. The conſequences of this act of inhumanity were ſuch as might have been expected; a ſhout of execration inſtantly aroſe; the cry *to arms* was heard; the military were aſſaulted on all ſides; the French guards joined their countrymen, and compelled the Germans, overpowered by numbers, and unſupported by the reſt of the army, to retire.

235 Cruelty of the Prince De Lambeſq.

236 Terror in the city univerſal.

All order was now at an end, and as night approached an univerſal terror diffuſed itſelf through the city. Bands of robbers were collecting; and from them or from the foreign ſoldiery a general pillage was expected. The night paſſed away in conſternation and tumult. It was found in the morning that the hoſpital of St Lazare was already plundered. The alarm bells were rung; the citizens aſſembled at the Hotel de Ville, and adopted a propoſal that was there made, of enrolling themſelves as a militia for general defence, under the appellation of the *national guard*. This day and the ſucceeding night were ſpent in tolerable quietneſs, without any attempt on the part of the army. On the morning of the memorable 14th of July, it was diſcovered that the troops encamped in the Champs Eliſees had moved off, and an immediate aſſault was expected. The national guard now amounted to 150,000 men; but they were in general deſtitute of arms. They had aſſumed a green cockade; but on recollecting that this was the livery of the Count d'Artois, they adopted one of red, blue, and white. M. de la Salle was named commander in chief, officers were choſen, and detachments ſent around in queſt of arms. In the Hotel des Invalides upwards of 30,000 ſtand of arms were found, along with 20 pieces of cannon; a variety of weapons was alſo procured from the *garde meuble de la couronne*, and from the ſhops of armourers, cutlers, &c.

The celebrated fortreſs of the Baſtile was an object of much jealouſy to the Pariſians. At 11 o'clock in the morning, M. de la Roſiere, at the head of a numerous deputation, waited upon M. de Launay the governor, who promiſed, along with the officers of his garriſon, that they would not fire upon the city unleſs they ſhould be attacked. But a report was ſoon ſpread through Paris, that M. de Launay had, in a ſhort time thereafter, admitted into the fortreſs a multitude of perſons, and then treacherouſly maſſacred them. The cauſe of this piece of perfidy has never been explained. The fact itſelf has been denied; but it was atteſted at the time by the duke of Dorſet, the Britiſh ambaſſador at the court of France. The effect of the report was, that a ſudden reſolution was adopted of aſſaulting the Baſtile; an immenſe and furious multitude ruſhed into its outer, and ſoon forced their way into its inner, courts, where they received and returned a ſevere fire for the ſpace of an hour. The French guards, who were now embodied into the national guard, conducted the attack with ſkill and coolneſs: they dragged three waggons loaded with ſtraw to the foot of the walls, and there ſet them on fire; the ſmoke of theſe broke the aim of the garriſon, while it gave no diſturbance to the more diſtant aſſailants. The beſieging multitude preſſed the attack with incredible obſtinacy and vigour for the ſpace of four hours; the garriſon was in confuſion; the officers ſerved the cannon in perſon, and fired their muſkets in the ranks; the governor, in deſpair, thrice attempted to blow up the fortreſs. A capitulation, when at laſt ſought, was refuſed to the garriſon, and an unconditional ſurrender took place. The governor, and M. de Loſme Salbrai his major, a gentleman of diſtinguiſhed humanity and honour, became victims of popular fury in ſpite of every effort that could be made for their protection; but the French guards ſucceeded in procuring the ſafety of the garriſon. Only ſeven priſoners were found in the Baſtile. A guard was placed in it, and the keys were ſent to the celebrated M. Briſſot de Warville, who a few years before had inhabited one of its caverns.

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237 The Baſtile attacked;

238 and ſurrendered unconditionally.

The remaining part of this eventful day was ſpent at Paris in a mixture of triumph and alarm. In the pocket of the governor of the Baſtile a letter was found, encouraging him to reſiſtance by the promiſe of ſpeedy ſuccours, written by M. de Fleſſelles, the prevot des marchands, or chief city magiſtrate, who had pretended to be a moſt zealous patriot. This piece of treachery was puniſhed by inſtant death; and his bloody head was carried through the city on a pole, along with that of M. de Launay. At the approach of night a body of troops advanced towards the city, at the Barriere d'Enfer. The new national guard hurried thither, preceded by a train of artillery, and the troops withdrew upon the firſt fire: barricadoes were everywhere formed, the alarm-bells were rung, and a general illumination continued during the whole of this night of confuſion.

239 A new miniſtry appointed.

In the mean time, it was obvious that the new miniſtry were entering upon a difficult ſcene of action, where one falſe ſtep might lead to ruin, and where their own plan of conduct ought to be maturely digeſted. Marſhal Broglio was made miniſter of war, the baron de Bretcuil preſident of finance, M. de la Galeziere comptroller-general, M. de la Porte intendant of the war department, and M. Foulon intendant of the navy;

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navy; but these were only meant to act as official men, under the Count d'Artois, and the other leaders of the aristocracy. To these leaders there did not even remain a choice of difficulties; no resource was left but that of overawing by military power the national assembly and the capital, and of risking the desperate measure of a national bankrupty, which the court had not formerly dared to encounter, and to avoid which it had convoked the states-general. No trace remains, however, of any attempt to put this criminal, but last resource, in execution. The evening after the departure of M. Neckar was spent by the court of Versailles in feasting and joy, as if a victory had been gained. The courtiers of both sexes went round among the soldiery, striving to secure their fidelity by caresses, largesses, and every species of flattering attention. The ministry not only failed to support the Prince de Lambesq in the post which he had been sent to occupy, but they suffered the whole of the 13th to pass in indecision, while the capital was in a state of rebellion, while an army was formally mustering within its walls, and the names of the principal nobility were put up in lists of proscriptions. They received the news of the capture of the Bastile with confusion and dismay, which were increased, if possible, by information given by Marshal Broglio, that the troops refused to act against Paris or the national assembly. In this perplexity they adopted the miserable device of concealing from the king the state of public affairs; and that unfortunate prince was thus perhaps the only person out of millions around him who remained ignorant of the convulsions in which his country was involved.

240 Their situation difficult, and their conduct bad.

At length, at midnight, the Duke de Liancourt forced his way into the king's apartment, and told him of the revolt of his capital, of his army, and of the surrender of the fortress of the Bastile. The Count d'Artois, who was present, still attempted to retain the monarch under his fatal delusion; but the Duke de Liancourt turning round, exclaimed, "As for you, Sir, your life can only be saved by instant flight; I have seen with horror your name in the bloody list of the proscribed." Accordingly the count, with the members of his short-lived administration and their adherents, fled to the frontiers. And thus an emigration commenced, the source of that terrible contest which has covered Europe with bloodshed and mourning. This ministry had, no doubt, many difficulties to contend against; but an accurate attention to their conduct excites a suspicion which, while it exculpates them from many intended crimes that have been laid to their charge, at the same time does little honour to their talents. It is this, that they had come into office without having formed any clear plan of conduct; that they were men acting without decision and at random, and consequently became the sport of those events which they wanted skill and vigour to direct or controul. By their introduction into office, and their misconduct while in it, the royal authority fell prostrate before the popular party in the national assembly. The nobles and the clergy still remained, but confounded in one assembly with the more numerous order of the *tiers etat;* and no longer rallying round a throne that was too feeble to afford protection, they soon yielded to that fierce and levelling spirit of democracy that now rose around them.

But the person of the monarch was still beloved.— Early next morning the king went to the assembly, but with none of the usual solemnities. He "regretted the commotions of the capital, disavowed any knowledge of an intention against the persons of the deputies, and intimated that he had commanded the removal of the troops." A deep and expressive silence prevailed for a few moments; this was succeeded by vehement and universal shouts of applause. The king rose to depart, and instantly the whole assembly crowded around, and attended him to his palace. The queen appeared at a balcony with the dauphin in her arms; the music played the pathetic air of *Où peut-on être mieux qu'au sein de sa famille.* The enthusiasm of loyalty communicated itself to the surrounding multitudes, and nothing was heard but acclamations of joy.

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241 The king goes to the assembly.

On the following day, the king declared his resolution to visit the city of Paris in person. Accordingly that prince, who never wanted personal courage, however deficient he might be in political stedfastness, set out, attended by some members of the assembly and by the militia of Versailles. He was met by the celebrated M. de la Fayette, at the head of a body of the national guard, of which he had now been chosen commander in chief. M. Bailly, in whose person the ancient office of mayor of Paris had been revived, received the king at the gates, and delivered to him the keys. All this while no shout was heard from the crowd of innumerable spectators but that of *Vive la nation.* The king advanced to the Hotel de Ville, where the new cockade was presented to him, which he put on, and presented himself with it at the window. At the sight of this badge of patriotism an universal shout of *Vive le Roi* burst forth from every quarter; and he returned to Versailles amidst general triumph and applause.

242 And next day visits the city of Paris in person;

Much confusion still prevailed in the capital; but there was more appearance of regularity than could have been expected at the conclusion of such important events. This arose from a casual concurrence of circumstances. To conduct with ease the elections to the states-general, Paris had been divided into 60 districts, each of which had a separate place of meeting. The people did not elect the members to the states-general; but they chose delegates, who under the name of electors, voted for the members. At the commencement of the disturbances, the electors, at the request of their fellow-citizens, assumed a temporary authority; of which, however, they were soon weary, and as soon as possible procured the public election of 120 persons as municipal officers for the government of the city. The citizens having got the habit of assembling in their districts, grew fond of it: they assembled frequently, made rules for their own government, and sent commissioners to communicate with other districts. The tumultuous nature of these meetings, and the vehemence of debate which prevailed in them, will best be conceived from the ludicrous contrivance of one of their presidents, who stationed a drummer at the back of his chair, and when the confusion and noise became altogether ungovernable, gave the signal for beating the drum, which speedily overpowered every other noise. These meetings, however, gradually ripened into clubs, in which much dexterity and intrigue were exerted.

243 in which much confusion still prevailed.

The whole of the late ministry escaped excepting M. Foulon.

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Foulon. His character, it may well be imagined, was extremely unpopular; for he is ſaid to have aſſerted, that he would "make the people of Paris eat hay." He had retired to the country, but was ſeized by his own vaſſals, and brought to Paris with a bundle of hay tied on his back. In ſpite of every effort made by M. M. Bailly and Fayette to procure him a fair trial at leaſt, he was carried to the *Place de Greve*, and hanged at a lamp-iron by the enraged multitude. His ſon-in-law, M. Berthier, attempting to defend himſelf againſt a ſimilar fate, fell, covered with wounds. Their heads were carried round on poles; and thus the populace became habituated to the ſight of blood and murder: they were even taught by popular ſongs to glory in ſuch actions, and particularly by the well known ſong *Ca-ira*.

244 Fate of M. Foulon, and Berthier.

245 Conſequences of M. Neckar's return.

In conſequence of an invitation from the king, M. Neckar returned to France. He was received by the aſſembly with great applauſe, and in Paris with infinite ſolemnity and triumph. He here, however, committed a political error that made ſome noiſe. In deploring the late exceſſes and murders, and taking notice of the arreſt of M. Bezenval, an officer of the Swiſs guards, he requeſted of the electors at the Hotel de Ville, in a ſolemn harangue, that the paſt ſhould be forgotten; that proſcriptions ſhould ceaſe, and a general amneſty be proclaimed. In a moment of enthuſiaſm this was agreed to, and the electors decreed what unqueſtionably exceeded their powers. The diſtricts of Paris were inſtantly in commotion; the electors alarmed, declared that they only meant that "henceforth the people would puniſh no man but according to law;" and at the ſame time, to prove that they themſelves were free from ambition, they formally renounced all their own powers. The aſſembly took up the queſtion. Lally Tolendal, Mounier, Clermont Tonnerre, Garat junior, and others, declared that no perſon ought to be arreſted without a formal accuſation; while Mirabeau, Robeſpierre, Barnave, and Gleizen, alleged, on the contrary, that the people were entitled to lay hold of any man who had publicly appeared at the head of their enemies. The debate ended, by admitting the explanation of the electors, and by a declaration that it was the duty of the aſſembly to ſee juſtice executed in all caſes.

246 The commotions, &c. of the capital reach to the provinces.

The commotions and enthuſiaſm of the capital were ſpeedily communicated to the provinces. In every quarter the people ſeized upon all the arms that could be found, and the military uniformly refuſed to act againſt them. Many acts of outrage were committed in Brittany, at Straſburg, in the Lyonnois, and elſewhere, in which the nobility were the ſufferers. The miſchiefs that occurred were uſually magnified at a diſtance; but that very circumſtance was an additional evil. For example: It was ſtated in the National Aſſembly that M. de Meſmay, lord of Quincey, invited a number of patriots, among whom were the officers of a neighbouring garriſon, to a ſplendid entertainment at his houſe, to celebrate the happy union of the three orders: That in the midſt of the feaſt the maſter of the houſe contrived to withdraw unnoticed, and to ſet fire to a train previouſly laid, which communicated with a quantity of gunpowder in the cellars, in conſequence of which the whole company, by a ſudden exploſion, were blown into the air. It was found on inquiry, that there was not one word of truth in the whole ſtory. But before this inquiry could be made, all France had reſounded with accounts of the pretended bloody tragedy; and the whole nobility of the kingdom ſuffered in a leſs or greater degree, from the prejudices excited by this unhappy report, the origin of which has never been well explained. It would be vain to ſtate all the idle rumours to which at this time the blind credulity of the multitude gave currency. At one time, the ariſtocrats were cutting down the green corn; at another time they were burying flour in common ſewers, or caſting loaves into the Seine. One report was no ſooner proved to be falſe than another aroſe, and the whole nation was agitated by ſuſpicion and alarm. The National Aſſembly were engaged in framing their celebrated declaration of the rights of man, which was to form the baſis of the new conſtitution, when the alarming accounts, received from all quarters, of the ſtate of anarchy into which the kingdom was falling, obliged them ſuddenly to turn their attention to objects of practical neceſſity. The privileged orders found themſelves become the objects of univerſal jealouſy and hatred; and that ſomething muſt inſtantly be done to ſave their families and property, which were menaced on every ſide with perſecution and pillage. Regarding the popular torrent as now become irreſiſtible, to ſave ſomething they reſolved to ſacrifice a part.

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247 Viſcount de Noailles and Duke d'Aguillon propoſe that

On the afternoon ſitting of the 4th of Auguſt, the Viſcount de Noailles, ſeconded by the Duke d'Aguillon, opened one of the moſt important ſcenes in the French Revolution, or in the hiſtory of any country. Theſe noblemen ſtated, that the true cauſe of the commotions which convulſed the kingdom exiſted in the miſery of the people, who groaned under the double oppreſſion of public contributions and of feudal ſervices. "For three months (ſaid M. de Noailles) the people have beheld us engaged in verbal diſputes, while their own attention and their wiſhes are directed only to things. What is the conſequence? They are armed to reclaim their rights, and they ſee no proſpect of obtaining them but by force." He therefore propoſed to do juſtice, as the ſhorteſt way of reſtoring tranquillity, and for that purpoſe to decree, that henceforth every tax ſhould be impoſed in proportion to the wealth of the contributors, and that no order of the ſtate ſhould be exempted from the payment of public burdens; that feudal claims ſhould be redeemed at a fair valuation; but that ſuch claims as conſiſted of perſonal ſervices on the part of the vaſſal ſhould be aboliſhed without compenſation, as contrary to the impreſcriptible rights of man. The extenſive poſſeſſions of the noblemen who made theſe propoſals added much luſtre to the diſintereſted ſacrifice which they afforded. Their ſpeeches were received with the moſt enthuſiaſtic applauſes by the Aſſembly and the galleries, and their propoſals were decreed by acclamation without a vote. No nation is ſo much led by the influence of ſudden emotions as the French. The patriotic contagion now ſpread faſt through every breaſt, and a conteſt of generoſity enſued. The hereditary juriſdictions poſſeſſed by the nobles within their own territories were next ſacrificed. All places and penſions granted by the court were ſuppreſſed, unleſs granted as the reward of merit or of actual ſervices. The game laws, which condemned the huſbandman, under ſevere penalties, to leave his property

248 the taxes ſhould be in proportion to the wealth of the contributors.

249 The game laws, &c. aboliſhed.

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ty a prey to infinite multitudes of animals reſerved for paſtime, had always been numbered among the ſevere grievances of the French peaſantry. Theſe were therefore renounced, along with the excluſive rights of rabbit warrens, fiſheries, and dovecotes. The ſale of offices was aboliſhed, and the fees exacted from the poor, together with the privilege of holding a plurality of livings, were relinquiſhed by the clergy. The deputies of the *Pais d'Etat*, or privileged provinces, with the deputies of Dauphiné at their head, next came forward, and offered a ſurrender of their ancient privileges, requeſting that the kingdom might no longer remain parcelled out among Dauphinois, Bretons, Provençaux, &c. but that they ſhould all form one great maſs of French citizens. They were followed by the repreſentatives of Paris, Marſeilles, Lyons, Bourdeaux, Straſbourg, &c. who requeſted leave to renounce all their ſeparate privileges as incorporations, for the ſake of placing every man and every village in the nation upon a footing of equality. Thus the aſſembly proceeded, till every member had exhauſted his imagination upon the ſubject of reform. To cloſe the whole, the Duc de Liancourt propoſed that a ſolemn *Te Deum* ſhould be performed, that a medal ſhould be ſtruck in commemoration of the events of that night; and that the title of RESTORER OF GALLIC LIBERTY ſhould be beſtowed upon the reigning monarch. A deputation was accordingly appointed to wait upon the king, reſpectfully to inform him of the decrees.

250 Many ancient privileges are voluntarily surrendered.

Several ſucceeding days were neceſſary to form into laws the decrees of the 4th Auguſt, and committees were appointed to make out reports for that purpoſe. One of theſe reports having included the tithes and revenues of the clergy among the abuſes that were to be done away, and having propoſed in lieu of them to grant a certain ſtipend to the different miniſters of religion to be payable by the nation, the clergy attempted to make a ſtand in defence of their property, and violent debates enſued. In theſe they were ably ſupported by the Abbe Sieyes: but as the clergy had formerly deſerted the nobles, ſo they were now in their turn abandoned to their fate by the hereditary ariſtocracy. The popular party had long regarded the wealth of the church as an eaſy reſource for ſupplying the wants of the ſtate.—Never was there a more complete proof of the influence of opinion over the affairs of men. The Catholic clergy of France, though poſſeſſed of more property than they enjoyed at the time when princes took up arms or laid them down at their command, now found ſo few defenders, that they were terrified into a voluntary ſurrender of all that they and their predeceſſors had poſſeſſed for ages. In their overthrow, they ſcarcely enjoyed even the barren honour of having fallen the laſt of thoſe privileged orders that ſo long had ruled over this ancient kingdom. They and the nobles, and the king, ſtill poſſeſſed their former titles and nominal dignity; but all of them were now ſubdued, and at the mercy of the commons of France, who ſpeedily diſmiſſed them at their pleaſure.

251 Tithes and revenues of the clergy taken away.

As a ſhort ſeaſon of tranquillity in the Court and the National Aſſembly ſucceeded theſe great popular ſacrifices, the king laid hold of it as a fit opportunity for the appointment of a new miniſtry. They conſiſted of the archbiſhop of Vienne, the archbiſhop of Bourdeaux, M. Neckar, the Count de St Prieſt, Count de Montmorin, the Count de la Luzerne, and the Count de la Tour du Pin Paulin. M. Neckar, as miniſter of finance, having ſtated the diſtreſſed ſituation of the revenue, preſented the plan of a loan of thirty millions of livres. But M. Mirabeau, from a ſpirit of rivalſhip, as it would ſeem, to M. Neckar, prevailed with the aſſembly to alter and to narrow the conditions of it in ſuch a degree that very few ſubſcribers were found, and the loan could not be filled up. This failure involved the aſſembly in a conſiderable degree of unpopularity; in conſequence of which they allowed M. Neckar to preſcribe his own terms for the purpoſe of obtaining a loan of eighty millions. But the happy inſtant of public confidence had been allowed to paſs away, and this loan was never more than half filled up. Recourſe was next had to patriotic contributions; and great numbers of gold rings, ſilver buckles, and pieces of plate, were preſented to the aſſembly. The royal family themſelves ſent their plate to the mint, either to give countenance to theſe donations, or, as M. Neckar has ſince aſſerted, through abſolute neceſſity, for the purpoſe of ſupporting themſelves and their family. The confuſion into which the nation had been thrown by the late events had produced a ſuſpenſion of the payment of all taxes. There exiſted, in fact, no efficient government; and if ſociety eſcaped entire diſſolution, it was merely in conſequence of thoſe habits of order which are produced by a ſtate of long continued civilization. The buſineſs of government could not be tranſacted without money, and many vain efforts were made by the miniſtry to procure it. At length M. Neckar was driven to the deſperate reſource of propoſing a *compulſory loan*, or that every individual poſſeſſed of property ſhould advance to the ſtate a ſum equal to one-fourth of his annual income. This bold propoſition was ſupported by Mirabeau, and adopted by the aſſembly; but it does not appear to have ever been effectually executed.

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253 Who find great difficulty in raiſing money.

254 Diſcuſſion on the *Rights of Man*,

In the mean time, the aſſembly was buſily occupied in framing the celebrated declaration of the *Rights of Man*, which was afterwards prefixed to the conſtitution. This was followed by the diſcuſſion of a point of much delicacy and difficulty; viz. What ſhare of legiſlative authority the king ought to poſſeſs under the new conſtitution: whether an abſolute negative or *veto*, a ſuſpenſive *veto*, or no *veto* at all? This queſtion operated like a touchſtone for trying the ſentiments of every perſon; and the aſſembly, conſiſting of 1200 men, was now ſeen to arrange itſelf into two violent contending factions. The debates were vehement and tumultuous, and continued for many days. As the aſſembly ſat in public, and as multitudes of people of all deſcriptions were admitted into the galleries, and even into the body of the hall among the members, many indecent ſcenes took place in conſequence of the interference of the ſpectators to applaud or cenſure the ſentiments which were delivered. Thus the public at large became ſpeedily intereſted in the diſcuſſion; the city of Paris took a ſide in oppoſition to the *veto*, and the whole empire was thrown into agitation by new and ſpeculative queſtions. The diſtinguiſhed place which France holds among the nations of Europe rendered theſe ſingular events and diſcuſſions the object of univerſal attention. The contagious love of novelty ſpread rapidly abroad, and gave riſe to that well-founded jealouſy on the part of the monarchs of Europe, which

155 and the king's *veto*.

was

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was ſpeedily to burſt forth in a bloody tempeſt.—In the preſent caſe, the people of Paris became moſt eagerly intereſted. Rumours of plots were ſpread through the country, and a new ſtorm was obviouſly gathering, when the queſtion was thus got quit of. M. Mounier remarked, that the executive power could poſſeſs no negative againſt the decrees of the preſent aſſembly, which had been nominated by the nation with ſupreme powers for the expreſs purpoſe of framing a conſtitution, which was to remain binding over all orders of men in the ſtate; and with regard to future legiſlatures, the cing declared by a meſſage, that he wiſhed to poſſeſs no more than a *ſuſpenſive veto*. It is remarkable that the popular Mirabeau concluded a ſpeech in favour of the abſolute *veto* of the crown with theſe words, "That it would be better to live in Conſtantinople than in France, if laws could be made without the royal ſanction." This political adventurer is, however, accuſed of having taken care to circulate in Paris a report that he had oppoſed the *veto* with all his influence; and to give credit to the ſtory, he is ſaid to have quitted the aſſembly juſt before the diviſion, that his vote might not appear on record againſt it.

256 Diſcuſſion about the legiſlative body, whether it ought to conſiſt of one or two chambers.

The month of Auguſt was ſpent in the debates about the *veto*; and in the beginning of September a new conſtitutional queſtion was preſented to the aſſembly by one of its numerous committees. This was, Whether the legiſlative body ought to conſiſt of one or of two chambers? Mounier, Lally Tollendal, Clermont Tonnerre, and others, who were zealous lovers of freedom upon what were then accounted moderate principles, ſupported eagerly the idea of eſtabliſhing two independent chambers in imitation of the Britiſh conſtitution; but they were deſerted both by the democratic and ariſtocratic parties. The firſt of theſe regarded an upper houſe or ſenate as a refuge for the old ariſtocracy, or as the cradle of a new one; while the higher nobles and clergy feared leſt ſuch an arrangement might prevent the future re-eſtabliſhment of the ancient diviſion into three orders. Of 1000 members who voted, only 89 ſupported the propoſal for dividing the legiſlature into two chambers.

257 The royal ſanction granted to the decrees of the 4th Auguſt, &c.

Soon after this, the king gave his ſanction to the important decrees of the 4th of Auguſt, but not without ſome heſitation, and expreſſing doubts of the wiſdom of ſome of them in a letter to the aſſembly. At the ſame time the *inviolability* of the perſon of the monarch was decreed, the indiviſibility of the throne, and its hereditary deſcent from male to male in the reigning family. But we ſhall not here attempt to enter into a detail of the various articles of the new conſtitution as connected with the circumſtances under which they became the ſubject of debate. We ſhall only ſtate thoſe more remarkable circumſtances which tend to aſcertain the peculiar changes which the ſentiments of the nation underwent in the progreſs of a revolution the moſt remarkable that occurs in human hiſtory.

258 State of parties in Paris.

In conſequence of the debates upon the queſtions of the *veto* and the two chambers, the minds of parties had become much irritated. Paris wore the ſame threatening aſpect that it had done in the months of June and of July preceding; and every thing ſeemed tending towards an important criſis. The ariſtocratic party accuſed their antagoniſts of a deſign to excite new inſurrections; and the charge was retorted, by circulating a report that a plot for conveying the king to Metz was already ripe for execution.

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259 Conſequences of their mutual jealouſies.

From the period of the defection of the French guards, who were now in the pay of the capital, the protection of the royal family had been entruſted to the militia or national guard of Verſailles, together with the regiment of the *gardes du corps*, which was compoſed entirely of gentlemen. Upon the circulation of the report of the intended flight of the king, the French guards began to wiſh to be reſtored to their ancient employment of attending his perſon, for the purpoſe of preventing any attempt of this nature. This idea was eagerly cheriſhed by the capital; and, in ſpite of every effort uſed by M. de la Fayette, the obvious appearance of approaching diſturbances could not be prevented. The popular party ſaw the advantages which they would derive from placing the aſſembly and the king in the midſt of that turbulent metropolis which had given birth to the revolution, and upon the attachment of which they could moſt ſecurely depend. Every encouragement was therefore given by the moſt active leaders of what was now called the *Democratic* party to the project of eſtabliſhing the court at Paris. The miniſtry were under no ſmall degree of alarm; and the count d'Eſtaing, who commanded the national guard of Verſailles, requeſted the aid of an additional regiment. The regiment of Flanders was accordingly ſent for: its arrival cauſed no ſmall degree of anxiety; and every effort was inſtantly made to gain over both officers and ſoldiers to the popular cauſe.

On the firſt of October the garde du corps, probably for the purpoſe of ingratiating themſelves with the newly arrived regiment, and perhaps to attach them more ſteadily to the royal cauſe, invited the officers of the regiment of Flanders to a public entertainment. Several officers of the national guard, and others of the military, were invited. The entertainment was given in the opera houſe adjoining to the palace; ſeveral loyal toaſts were drank: but it is aſſerted, that when the favourite popular toaſt *The Nation* was given, it was rejected by the gardes du corps. In ordinary caſes, ſuch a trifling circumſtance as this, or even any other of the tranſactions of a night of feſtivity, would juſtly be regarded as unworthy of notice in recording the more remarkable events in the hiſtory of a great nation; but ſuch was now the ſingular ſtate of affairs, that the moſt trivial occurrences were inſtrumental, by their combination, in the production of important conſequences. The queen, having ſeen from a window of the palace the gaiety which prevailed among the military, prevailed with the king, who was juſt returned from hunting, to viſit them along with herſelf and the dauphin. Their ſudden appearance in the ſaloon kindled in an inſtant the ancient enthuſiaſm of French loyalty. The grenadiers of the regiment of Flanders along with the Swiſs chaſſeurs, had been admitted to the deſſert; and they, as well as their officers, drank the health of the King, Queen, and Dauphin, with their ſwords drawn. The royal family having bowed with politeneſs to the company, retired. Of all nations, the French are moſt liable to the influence of ſudden impreſſions: the muſic played the favourite air, *O Ricard! O mon Roi! l'univers t'abandonne*, "O Richard! O my king! the world abandons thee." In the eagerneſs of loyalty,

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loyalty, the national cockade, which had been adopted by ſome of the gardes du corps, was thrown aſide, and white cockades were ſupplied as quickly as they could be made by the ladies of the court.

When theſe events were next day reported at Paris, accompanied by a multitude of exaggerations, they gave riſe to the moſt violent alarm. The capital was at that time ſuffering all the horrors of famine; and in ſuch a ſituation, the news of a feaſt which others have enjoyed, ſeldom gives much pleaſure to hungry men. To the former report of an intended flight on the part of the royal family, it was now added, that a counter revolution was ſpeedily to be attempted by force of arms; and that the preſent ſcarcity was artificially created by the court for the purpoſe of reducing the people to ſubmiſſion. Their ariſtocratic antagoniſts have ſince aſſerted, that the famine was indeed artificial; but that it was created by a portion of the violent party in the national aſſembly, which was then denominated the *Cabal*, whoſe object was to excite commotions as the means of procuring an opportunity of ſetting the duke of Orleans at the head of the ſtate, either as regent, or in ſome other form. To this laſt party Mirabeau is ſaid to have belonged.

For four days no notice was taken in the aſſembly of what had paſſed at the entertainment given by the gardes du corps. On the 5th of October M. Petion mentioned it for the firſt time, and a violent debate enſued; during which Mirabeau roſe and exclaimed, "Declare that the king's perſon *alone* is ſacred, and I myſelf will bring forward an impeachment;" thereby alluding to the conduct of the queen. While this debate was proceeding at Verſailles, the city of Paris was in commotion. A vaſt multitude of women of the loweſt rank, with ſome men in women's clothes, had aſſembled at the *Hotel de Ville*, and were calling aloud for arms and bread. They reſolved to proceed inſtantly to Verſailles to demand bread from the king and from the national aſſembly. La Fayette oppoſed them in vain; for his own ſoldiers refuſed to turn their bayonets againſt the women. Upon this one Staniſlaus Maillard, who had diſtinguiſhed himſelf at the taking of the Baſtile, offered himſelf as a leader to the inſurgents. He had the addreſs to prevail with them to lay aſide ſuch arms as they had procured; and he ſet out for Verſailles about noon with as much order among his followers as could well be expected from ſuch an aſſemblage. Either becauſe the paſſion for going to Verſailles had ſuddenly become too infectious to be reſiſted, or becauſe the multitude already gone thither was now accounted dangerous, the mayor and municipality of Paris thought fit to give orders to La Fayette inſtantly to ſet out for that place at the head of the national guard.

260 A multitude of women of the loweſt rank march to Verſailles,

In the mean time, Maillard approached Verſailles with his tumultuous troop; he arranged them in three diviſions, and perſuaded them to behave with tolerable decency. The king was hunting in the woods of Mendon when he was informed of the arrival of a moſt formidable band of women calling aloud for bread. "Alas! (replied he) if I had it, I ſhould not wait to be aſked." Maillard entered the aſſembly accompanied by a deputation of his followers to ſtate the object of their journey. The aſſembly, to pacify them, ſent a deputation of their own number along with them to

261 nd ſend depu- tion to e aſſem- y.

lay their complaints before the king. His majeſty received the whole with great politeneſs, and readily agreed to go into any meaſures for the ſupply of the capital that could be ſuggeſted. The report of this behaviour had ſuch an effect upon the multitude collected around the palace, that they began to diſperſe; but they were ſpeedily ſucceeded by another crowd not leſs numerous. A ſudden reſolution of flight ſeems now to have been propoſed by the court; for the king's carriages were brought to the gate of the palace which communicates with the orangery: but the national guard of Verſailles refuſed to allow them to paſs, and the king himſelf refuſed to remove, or to allow any blood to be ſhed in his cauſe.

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262 La Fayette with his army reaches Verſailles at night.

La Fayette with his army at length arrived about 10 o'clock at night, and found the aſſembly in a very unpleaſant ſituation. Their hall and galleries were crowded by the Pariſian fiſh-women and others of the mob, who, at every inſtant, interrupted the debates. La Fayette waited upon the king, and informed him of the proceedings of the day, planted guards in every quarter; and after a ſcanty banquet had been procured for the multitude, he prevailed with the aſſembly to cloſe their ſitting for the night. In this laſt part of his conduct M. la Fayette has been much cenſured, and probably not without reaſon; for it could ſcarcely be expected that ſuch a night would be ſpent in peace by the immenſe aſſemblage of turbulent characters that were now brought together. All was quiet, however, till about ſix in the morning of the 6th, when a great number of women and deſperate perſons ruſhed forward to the palace, and attempted to force their way into it. Two of the gardes du corps were killed; the crowd aſcended the ſtaircaſe leading to the queen's apartment, but were bravely reſiſted by M. Miemandre a ſentinel, who gave the alarm, and defended his poſt till he fell covered with wounds, of which, however, he afterwards fortunately recovered. The ruffians, reeking with his blood, ruſhed into the chamber of the queen, and pierced with bayonets and poniards the bed whence this perſecuted woman had but juſt time to fly almoſt naked, and, through ways unknown to the murderers, had eſcaped to ſeek refuge at the feet of the king, who was already alarmed, and had gone to ſeek her.

263 Deſperate attempt on the queen.

The tumult became more violent every moment, and ſudden death ſeemed to threaten the royal family; but La Fayette was by this time at the head of his troops, whom he beſeeched earneſtly to ſave the gardes du corps from maſſacre. In this he was ſucceſsful; ſome that had been taken priſoners were ſurrounded by the grenadiers of the French guards, who protected them, and the retreat of the whole corps was eaſily ſecured. The crowd was ſpeedily driven from the different quarters of the palace, which they were already beginning to pillage; and the royal family ventured to ſhow themſelves at a balcony. A few voices now exclaimed, *Le Roi à Paris*, "the King to Paris." The ſhout became general; and the king, after conſulting with la Fayette, declared that he had no objection to take up his reſidence at Paris, provided he was accompanied by the queen and his children. When the propoſal was reported to the aſſembly, the popular leaders expreſſed much ſatisfaction. They ordered a deputation of 100 members to attend the king thither; they voted the national aſſembly inſeparable from the king. His majeſty

264 The royal family ſaved by Fayette.

France. 1789.

265 Are carried priſoners to Paris.

ſet out at two o'clock a priſoner in the cuſtody of the mob. Two gentlemen were ſelected from his body guard, and, with all the parade of an execution, beheaded in the court of his palace. Their heads were ſtuck upon ſpears, and led the proceſſion; whilſt the royal captives who followed in the train, and beheld this ſpectacle, were conducted ſo ſlowly, that a ſhort journey of twelve miles was protracted to ſix hours. The king, the queen, and their children, were lodged in the old palace of the Louvre, while Monſieur went to reſide at the Luxemburg. The city was illuminated, and the evening ſpent in triumph by the Pariſians.

266 Triumph of the popular party.

The removal of the king to Paris was regarded as a triumph by the popular party. The higher order of nobles conſidered it as completely ruinous to their hopes; and even many men of talents, ſuch as Mounier and Lally Tollendal, whom we cannot avoid regarding as friends to the popular cauſe in its outſet, now regarded every proſpect of attaining a happy conſtitutional freedom as at an end, as the national repreſentatives muſt be for ever expoſed to the inſults, and overawed by the influence of a turbulent capital. Many members of the aſſembly took refuge in foreign countries, and uſed every effort to excite the other nations of Europe to hoſtility againſt France. As the duke of Orleans had been regarded as a chief agent in promoting the late diſturbances, the marquis de la Fayette waited upon him, and inſiſted upon his leaving the kingdom for a time. The duke was overawed, and, on pretence of public buſineſs, went to England, where he remained for ſeveral months.

267 The aſſembly holds its firſt ſeſſion at Paris.

On the 19th of October, the National Aſſembly held its firſt ſeſſion in Paris. The king was cloſely guarded in his own palace; and no apparent oppoſition now ſtood in the way to prevent the popular party from giving to their country ſuch a conſtitution as they might judge expedient. Much, however, was yet to be done, and many difficulties remained, reſulting from the habits of men educated under a very different order of things. Two days after the aſſembly came to Paris, a baker was publicly executed by the mob, upon a falſe accuſation of having concealed a quantity of bread.—While the aſſembly was at a diſtance, events of this nature had been little attended to, and the leading party avoided attempting to check theſe ebullitions of popular violence, from which they had derived ſo much advantage; but that party was now all powerful, and ſo flagrant an offence committed againſt the law was regarded as an inſult upon the ſovereignty of the National Aſſembly. Two leaders of the mob were therefore tried and publicly executed, and a ſevere law was paſſed, of the nature of the Britiſh riot act, authoriſing the magiſtrates to act by military force againſt any multitude of perſons that ſhould refuſe to diſperſe. Thus the peace of the capital was ſecured for ſeveral months; but in the country at large no ſmall degree of anxiety and trouble ſtill ſubſiſted. The ſame ſuſpicious temper which had prevailed at Paris agitated the provinces with the dread of plots and monopolies of grain. Add to this, that the nobleſſe in the country were by no means ſatisfied with the liberality with which their repreſentatives had on the 4th of Auguſt voted away their privileges and their property. This produced violent jealouſies between the peaſants and their lords, and gradually conveyed to every corner of the kingdom the political ferment which had commenced at Paris.

France. 1789.

The National Aſſembly being now, however, in tolerable ſecurity, proceeded in the arduous attempt of forming a free conſtitution for the great empire of France. The Abbé Sieyes preſented a plan for dividing the kingdom into 83 *departments*, of about 324 ſquare leagues, and each department into ſeveral *diſtricts*, and each diſtrict was ſubdivided into *cantons* of four ſquare leagues in extent. Thus the whole of the ancient diviſions of the kingdom into governments, generalities, and bailiwicks, was in an inſtant obliterated. An attempt was alſo made to ſimplify in an equal degree the relative ſituation of individuals in civil life, by a decree which put an end to all diſtinction of orders and immunities, ſo far as any privileges whatever was concerned. At the ſame time, a bold and moſt important meaſure was adopted, which has ſince proved the organ of thoſe terrible efforts which France has been enabled to make againſt the reſt of Europe. This was the confiſcation of the whole of the lands belonging to the church, for the purpoſe of ſupplying the exigencies of the ſtate. In this tranſaction, all regard to juſtice was thrown aſide. The lands of the church were as certainly the property of the then poſſeſſors of them as any entailed eſtate among us is the property of him who occupies it. The ſtate may have had a right to appropriate to itſelf the church lands upon the death of the incumbents; but it might with equal juſtice, and perhaps greater propriety, have ſeized the enormous revenues of the duke of Orleans, as have confiſcated a ſingle acre belonging to the moſt uſeleſs abbot without his own conſent. This nefarious meaſure was propoſed by the biſhop of Autun, M. Talleyrand Perigord, a man of no religion, who had been promoted to the bench in a moſt irregular manner to ſerve this very purpoſe. The mode in which this property was to be expended was by iſſuing aſſignments (*aſſignats*) upon it; which aſſignments were to be received by the ſtate for the payment of taxes, or for the purchaſe of church lands when ſet up to ſale. A proviſion was at the ſame time made for the national clergy, who were for the future to be paid by the ſtate. On the day following that on which this important meaſure was adopted, a decree was paſſed, ſuſpending the parliaments of the kingdom from the exerciſe of their functions.

268 The kingdom diviſed into 83 departments.

269 The church lands confiſcated.

Decrees, in which the intereſts of ſo vaſt a multitude of individuals were involved, could not be carried into effect without much murmuring and oppoſition. The parliaments, in particular, began to exert themſelves with vigour, and, by proteſts and other publications, attempted to invalidate the decrees of the aſſembly as illegal; but theſe privileged bodies, who had often been accuſtomed to contend with ſome ſucceſs againſt the deſpotic adminiſtration of their country, and on that account had been for ages the objects of public applauſe, now found themſelves utterly forſaken, and unable to reſiſt the mandate of a popular aſſembly. After a few fruitleſs ſtruggles, they were all of them under the neceſſity of ſubmitting to their fate.

270 Fruitleſs attempts of the parliaments.

Nothing remarkable now occurred for ſome time.—The aſſembly proceeded to organize the kingdom by the eſtabliſhment of municipalities, and by reforming the juriſprudence of the country. It is to be obſerved, however, that when the parliament of Paris was aboliſhed,

271 Municipalities eſtabliſhed, &c.

France. lished, the Chatelet, being the second court in that city, was retained for the purpose of trying those persons who had become most obnoxious by their attachment to the royal cause. This court had the spirit to acquit the Baron de Bezenval, Marshal Broglio, and the Prince de Lambesq. But having incurred much popular odium on this account, they were guilty of the unworthy meanness of condemning to death the Marquis de Favres, for a pretended conspiracy (of which no tolerable proof was ever brought) to massacre La Fayette, Bailly, and Neckar, and to convey the king to Peronne.

1790. During the whole of this winter the king had been very strictly watched by numerous guards placed round his palace, insomuch that the other nations of Europe considered him as in a state of captivity. To do away this impression, if possible, and to make their king appear a voluntary agent in the measures that had lately been adopted, was now regarded as a matter of some importance. Every effort was therefore made to prevail with him to come to the assembly suddenly, and, as it were, of his own voluntary motion, there to declare his adherence to the measures which had lately been adopted. For some time he resisted this proposal; but at length, on the 4th of February, he did suddenly appear in the national assembly, where he complained of the attempts that had been made to shake the new constitution. He declared his wish "that it should be universally known that the monarch and the representatives of the nation were united, and their wishes were the same; that he would defend the constitutional liberty of the state; that, in conjunction with the queen, he would early form the sentiments of his son for that new order of things which the circumstances of the empire had introduced." This declaration dispirited the aristocratic party in no small degree, and increased that unhappy tendency of looking for aid from foreign countries which they had always been too apt to indulge.

272 Monasteries suppressed, and their lands confiscated. On the 13th of February, monastic establishments were suppressed, and their lands confiscated; but the present friars and nuns were allowed pensions for their subsistence, and to continue the observance of their monastic vows, if they thought fit. We may observe here, that, in consequence of the evacuation of the monasteries, it is probable that about this time the *Breton* committee began to assume the appellation of the *Jacobin Club*, from the hall belonging to the Jacobin friars at Paris, in which their meetings were now held.

March 15th 273 The Red Book, or list of pensions and donations, published. An event occurred at this time which tended in no small degree to increase the odium under which the old government already laboured. This was the publication of the *Red Book*, or list of pensions and donations granted by the crown. In consequence of the most pressing instances, it had been communicated by M. Neckar to a committee of the assembly, after many entreaties, and the most solemn promises of secrecy. It afforded, however, too striking an advantage to the popular party not to be made use of, and in a few days M. Neckar, to his no small surprise, saw this register publicly sold by every bookseller in Paris. He ought not, indeed, to have been surprised; and the giving up of this list is one of the many proofs which the transactions of that period afford of his great unfitness for the office which he held. With much indignation, however, he demanded why the committee had published it without the permission of the assembly or the king? But he was told by the committee, that "as to the assembly, they were sure of its approbation; and as to the king, they were not his representatives." To give an idea of the effect of this publication, it is only necessary to remark, that, under the short administration of M. Calonne, the two brothers of the king had received from the public treasury, independent of their legitimate income, nearly two millions sterling, and that 600,000l. had been granted to an individual, because he was the husband of Madame de Polignac. M. Neckar's opposition to this publication tended in no small degree to injure his popularity, and the rest of the ministry began to lose the confidence of the public. Indeed, at this time, fertile causes of alarm prevailed on all sides. The clergy were attempting to revive in the provinces the ancient animosities between the Roman Catholics and the Protestants, ascribing the late decrees of the assembly to the latter. The German princes who possessed property in the north of France were complaining loudly of the violation of their rights by the abolition of the feudal system, although the national assembly had voted to them a compensation. The most melancholy intelligence was received from their colonies in the West Indies. In regulating these, the assembly had not recognized the right of the free negroes to enjoy the same privileges with other citizens; at the same time, they did not go the length of denying these privileges. This uncertain conduct produced infinite calamities. The whites contended with those commonly called *people of colour*. These again sometimes stood in opposition to the free negroes, or to the slaves; and hence it sometimes happened that no less than three hostile assemblies were held at the same time in the same colony, which made war upon each other with the most inveterate fury. Each party found protectors in the national assembly of the parent state. Those who favoured or opposed the existence of distinctions at home, in general followed out the same principle with regard to the colonies.

France. 1790. 274 Effect of its publication.

275 Numerous sources of alarm.

276 Debate on the royal power to declare peace and war. On the 14th of May, M. de Montmorency communicated to the national assembly the preparations for war in which England and Spain were engaged. This brought forward the constitutional question, "Who ought to possess the power of declaring peace and war?" The Count Clermont Tonnerre, Messrs de Serent, Virieu, and Dupont, supported the royal prerogative; while on the other side, the exclusive right of the legislative body to exercise this important prerogative was supported by Messrs d'Aiguillon, Garat jun. Freteau, Jellot, Charles Lambeth, Sillery, Petion, Robespierre, &c. M. Petion proposed a decree "that the French nation renounced for ever all idea of conquest, and confined itself entirely to defensive war;" which was passed with universal acclamation. The Count de Mirabeau at length successfully proposed that peace and war should be declared by the king and the legislative body in conjunction; and the decree that was passed on the subject is a strange farrago of contradictions and absurdities. It enjoined the king to "guard the state from external attacks." But how could this be done, without repelling any attack that might be made upon it? This, however, he could not do, without previously informing the national assembly; and if that body chanced

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not to be ſitting at the time, he was bound to let the enemy advance without oppoſition till he had convened his orators, diſperſed over 20,000 ſquare leagues, and liſtened to their metaphyſical quibbles in Paris.

277 Farce acted in the aſſembly by a Pruſſian refugee, &c.

On the 16th June, a very ſingular farce was acted in the aſſembly. A Pruſſian refugee, who called himſelf Anacharſis Clouts, and who was ſtruggling hard to bring himſelf into public notice, on an evening ſitting (which, it is to be obſerved, was generally ill attended by the perſons of the higheſt rank), introduced to the aſſembly a number of perſons dreſſed in the different habits of all the different countries that could be thought of. In a formal harangue, he told the aſſembly that he was come, as the *orator of the human race*, at the head of the repreſentatives of all nations, to congratulate them upon the formation of their new conſtitution. He was anſwered by the preſident with abundance of ſolemnity, and retired with his motley groupe. This fantaſtical piece of folly, which in any other country than France would ſcarcely, perhaps, have excited a ſmile, was treated by the aſſembly in a ſerious light. Alexander Lameth propoſed, that the figures of different nations exhibited in chains at the feet of Louis XIV. ſhould be deſtroyed as an inſult upon mankind.

278 Abolition of hereditary titles.

M. Lambel, a lawyer, at this moment propoſed the *abolition of all hereditary titles*. He was ſupported by La Fayette, St Fargeau, and the Viſcount de Noailles. The decree was paſſed, along with another ſuppreſſing all armorial bearings. It is our intention at preſent rather to ſtate facts than to hazard any political opinion concerning the wiſdom or folly of the tranſactions which we record. It may here, however, be remarked, that no part of the proceedings of the French national aſſembly was received by perſons of rank upon the continent of Europe with ſo much indignation as this. —The feudal ſyſtem had been overturned, and the property of the church wreſted from it, with little comparative notice; but when thoſe nominal diſtinctions were attacked which antiquity had ſanctioned, and perſonal vanity rendered dear, the ſurrounding nations were inſtantly alarmed, and beheld with terror the levelling precedent. We may likewiſe add, that no part of their proceedings was more inimical to rational and practical freedom. To preſerve a perfect equality of ranks is impoſſible. In a commercial nation, induſtry will procure wealth, and wealth will every where procure dependents. Now nothing more contributes to keep within ſome tolerable bounds the inſolence of newly acquired wealth, than the rank attached to birth and nobility, which time and prejudice have conſpired to make reſpectable. It is not a little remarkable, that of all the king's miniſters, Neckar alone, a plebeian, a republican, born and bred in a democracy, adviſed his majeſty to refuſe his aſſent to this fooliſh decree, as a violent but uſeleſs encroachment upon the prejudices of a powerful order of the ſtate.

279 Propoſal to commemorate the taking of the Baſtile.

In the mean time, the capital was entirely engroſſed by hurry and buſtle. M. Bailly had propoſed a plan for commemorating the anniverſary of the taking of the Baſtile. It was adopted, becauſe it flattered the vanity of the people, by preſenting them with a ſplendid ſpectacle in commemoration of their own exertions. —The army had been much diſorganiſed; and it was reſolved to attempt to unite all its branches, as well as the whole departments of the ſtate, in one common attachment to the new order of things, by collecting into one place deputations, for the purpoſe of ſwearing fidelity to the new conſtitution. In the middle of the Champ de Mars an altar was erected, at which the civic oath, as it was called, was to be taken. Around the altar an amphitheatre was thrown up capable of containing 400,000 ſpectators: 2000 workmen were employed in this operation; and the people of Paris fearing leſt the plan might not be completed, aſſiſted in the labour. All ranks of perſons, the nobles, clergy, and even ladies, with the eagerneſs for novelty ſo peculiar to that people, united their efforts. Crowds of foreigners as well as natives hurried to the capital to be preſent at this ſolemnity, which was called the *Confederation*. The long-expected 14th of July at length arrived. At ſix o'clock in the morning the proceſſion was arranged on the Boulevards, and conſiſted of the electors of the city of Paris, the repreſentatives of the commons, the adminiſtrators of the municipality, a battalion of children, with a ſtandard, inſcribed "The hopes of the nation;" deputies from the troops of France wherever quartered, and of every order, along with deputies from all the departments; to theſe were added immenſe detachments of the military, and of the national guards, along with an almoſt infinite multitude of drums, trumpets, and muſical inſtruments. The proceſſion was extremely ſplendid, as every diſtrict had its peculiar decorations. The national aſſembly paſſed through a grand triumphal arch, and the king and queen, attended by the foreign miniſters, were placed in a ſuperb box. After a ſolemn invocation to God, the king approached the altar, and, amidſt the deepeſt ſilence, took the following oath: "I the king of the French do ſwear to the nation, that I will employ the whole power delegated to me by the conſtitutional law of the ſtate, to maintain the conſtitution, and enforce the execution of the law." The preſident of the national aſſembly then went up to the altar, and took the civic oath, "I ſwear to be faithful to the nation, the law, and the king; and to maintain with all my powers the conſtitution decreed by the national aſſembly, and accepted by the king." Every member of the aſſembly ſtanding up, ſaid, "That I ſwear." La Fayette then advancing, took the oath for himſelf; the other deputies of the national guards pronouncing after him, "That I ſwear;" and theſe words were ſolemnly pronounced by every individual of this immenſe aſſembly. *Te Deum* was then ſung. The performance was ſublime beyond the powers of deſcription. Never perhaps before was there ſuch an orcheſtra, or ſuch an audience: their numbers baffled the eye to reckon, and their ſhouts in full chorus rent the ſkies. It is impoſſible to enumerate all the means which were employed to add ſplendor to this day. It ended with a general illumination, and no accident diſturbed the public tranquillity.

France. 1790. 280 Ceremony of the confederation.

281 The ſoldiers at Nancy diſguſted, and the conſequences.

The aſſembly now proceeded in the formation of the conſtitution with conſiderable tranquillity; which, however, was diſturbed by an unhappy event at Nancy. Moſt of the officers of the army were unfriendly to the late revolution, and every means had been employed by them to diſguſt the ſoldiers with it. At Nancy, in particular, neceſſaries had been denied them, and their pay was kept back, under pretence that this was the will of the national aſſembly. Driven to deſpair, the regiments in garriſon threw off their allegiance, and demanded

France. 1790. manded loudly the regimental accounts. They ſeized at the ſame time the military cheſt, and ſent a deputation to ſtate their caſe at Paris to the national aſſembly. But the officers were before-hand, and prepoſſeſſed the miniſter of war againſt them; upon whoſe repreſentation a decree was paſſed, authoriſing the commander in chief of the province, M. Bouillé, to reduce the inſurgents by force. This was no ſooner known, than the national guard of Nancy aſſembled, and ſent a deputation to give a fair ſtatement of facts. But Bouillé, without waiting the reſult of an explanation, haſtened to Nancy at the head of all the troops he could ſuddenly collect; and having fallen upon the regiments of Chateauvieux and Meſtre de Camp, after putting an immenſe multitude to the ſword, he took 400 priſoners.

The king's regiment was prevented from acting againſt Bouillé by the intrepidity of a young officer of the name of *Deſſilles*, who, however, died of the wounds which he received on the occaſion. The news of theſe events filled Paris with indignation. The aſſembly afterwards reverſed its own decrees againſt the inſurgents at Nancy. Public honours were decreed to the memory of Deſſilles; but Bouillé could not be puniſhed, becauſe he had only acted in obedience to authority.

282 M. Neckar reſigns, and leaves the kingdom without being regretted.

M. Neekar's popularity had been gradually declining, as he was unwilling to go all the lengths that the ruling party wiſhed. He gave in his reſignation on the 4th of September, and ſpeedily thereafter left the kingdom. He was regretted by no party. He was regarded, on the one ſide, as having conducted the kingdom to its ruin, by the conceſſions which he originally adviſed the king to make in favour of the *tiers etat*; while he was deſpiſed by the oppoſite party as a lukewarm politician, of narrow views, and a feeble mind. He departed, however, with the unblemiſhed reputation of ſtrict integrity. M. Neckar does not ſeem to have penetrated deeply into the characters of men, or to have had any conception of the effects of that terrible and reſtleſs energy which is called forth in a nation which attempts to make important changes in its ancient manners and government. Having no conception of the important era which was about to open upon that country of which he was the miniſter, he was far from being qualified to direct or controul it amidſt the convulſions which it was deſtined to encounter. Unable to brook the loſs of his popularity, he peeviſhly retired to Swiſſerland, where he publiſhed a work, which ſhows to the conviction of every unprejudiced reader the integrity of the Freneh king, and the wicked projects of the leading demoerats, whom he himſelf had armed with power.

283 Attempts to re-organize the navy.

The remaining part of this year was occupied in attempts to introduce ſome degree of ſubordination into the navy of France, whieh had been much diſorganized, and in farther regulating the affairs of the clergy. It was now declared, that ſuch clergymen as ſhould not take the following oath, whieh had been preſcribed ſome months before, ſhould be conſidered as ejected from their benefices: "To watch carefully over the faithful in the pariſh or dioceſe which was entruſted to his care; to be faithful to the nation, the law, and the king; and to maintain to the utmoſt of his power the new conſtitution of Franee, and particularly the decrees relative to the civil conſtitution of the clergy." This decree rendered the ſituation of conſcientious men extremely perplexing; eſpecially as the pope teſtified in marked terms his diſapprobation of the oath. The people were reduced to the dilemma of chooſing between their new politieal and their old religious prejudices, and the reſult was extremely unfavourable to the intereſt of religion. France.

1791.

284 Hoſtile appearances in Germany, &c.

The aſſembly commenced the new year with a decree, announcing the termination of its ſeſſion, which was to take place as ſoon as it ſhould have finiſhed the diſcuſſion of a liſt of conſtitutional articles. In the mean time, on the ſide of Germany, Spain, Italy, and Savoy, hoſtile appearanees began to be exhibited, and bodies of troops advanced around the French frontier. The emperor Leopold was, however, too cautious to announce his intentions; and the king ſoon communicated a letter from him, containing proteſtations of amicable diſpoſitions, but adding, that "the innovations occaſioned by the decrees of the 4th of Auguſt ought to be done away." The king treated this merely as an official meaſure on the part of the emperor, that he might not appear to renounce the claims of certain German princes connected with Lorraine and Alſace. But the aſſembly expreſſed ſome alarm, and voted an augmentation of the national foree. About this period ſeveral new efforts were made by the diſaffected clergy in various parts of the kingdom to excite diſturbances, which it is unneceſſary to mention in detail. On the 20th of February the public attention was rouſed by a circumſtance that in any other ſtate of affairs would have been accounted unimportant. The king announced to the aſſembly, that his aunts, the daughters of Louis XV. had that morning left Paris; but as he did not apprehend that the exiſting laws laid them under any reſtraint in this reſpect, he had not oppoſed their departure. After ſome debate, the aſſembly agreed that the king had judged well; and theſe princeſſes were left to purſue their journey to Rome, which they reached after ſome delays occaſioned by the jealouſy of certain municipalities through which they paſſed. Thus the kingdom was gradually deſerted by every braneh of the royal family, excepting the king and his eldeſt brother Monſieur. The aſſembly, however, continued its labours with conſiderable quietneſs. In the end of the month of March died the celebrated M. de Mirabeau, at the age of 42 years; a man whoſe integrity has for many good reaſons been much ſuſpected, but whoſe political addreſs and intrepidity, and whoſe ſplendid powers of eloquence, have been ſeldom equalled. He received from his eountrymen at his death marks of reſpect unparalleled in modern hiſtory. During his ſhort illneſs, his door was beſieged by anxious citizens. A mourning of eight days was decreed by the aſſembly, and alſo a grand proceſſion, which was attended by all the public functionaries. He was the firſt who was interred in the new magnificent Pantheon, conſecrated to the reception of the remains of illuſtrious men. But his aſhes were afterwards removed, in conſequenee of very clear proofs that he had not been incorruptible by money.

285 Departure of the king's aunts from Paris.

286 Death of Mirabeau.

287 An emigrant army aſſembled on the borders of Alſace.

During the whole of this ſpring, much fear was entertained that ſome attempts at a counter revolution were about to be made. The emigrant army aſſembled on the borders of Alſace was reviewed by the prince of Condé. Their uniform was black, faced with yellow, with

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with a death's head, ſurrounded by a laurel wreath, on one cuff, and a ſword on the other; with the motto, "Conquer or die." The king was alſo ſurrounded by crowds of nonjuring prieſts and other diſaffected perſons. Thus, that popular jealouſy which in every period of the revolution has ſtrikingly marked the French character, was kept on the alarm. On the 18th of April, therefore, when the royal family was preparing to go to St Cloud to paſs ſome days, a report was inſtantly ſpread that the king was about to fly from the country. The carriages were immediately ſurrounded by people. La Fayette drew out the national guard, but they refuſed to act. "We know (exclaimed they) that we are violating the laws, but the ſafety of our country is the firſt law." The king inſtantly went to the aſſembly, and with much ſpirit complained of the inſult. He was anſwered reſpectfully by the preſident, and continued his journey. As the royal family had enjoyed a conſiderable degree of freedom for ſome time paſt, which was demonſtrated by the unſucceſsful oppoſition made to this journey—the preſent opportunity was embraced for intimating to foreign courts his acceptance of the conſtitution; and all obnoxious perſons were diſmiſſed from about his perſon. The breach of diſcipline on the part of the national guard on this occaſion was ſo much reſented by La Fayette, that he reſigned his command. Paris was thrown into conſternation; and it was not till after the moſt univerſal ſolicitation that he was prevailed upon to reſume his office.

238 Jealouſy of the people and military left the king and his family ſhould emigrate.

289 Behaviour of Bouille on the frontiers.

About this time M. de Bouillé, to whom the protection of the frontiers was entruſted, was employing, as it is now ſaid, every means in his power to render the country defenceleſs. The garriſons were left unprovided; diſunion was ſpread among the national troops; they were removed from the frontiers, and their place was occupied by foreigners, wherever it could be done. The emigrants abroad, and their friends at home, were lying in wait for an opportunity of revolt;—when ſuddenly, on the 21ſt of June, it was announced from the Thuilleries, that the king, the queen, the dauphin, with monſieur and madame, had quitted the palace and the capital, without leaving any information of their intention or their route. The emotion excited by this news among the multitude was a mixture of conſternation and rage. The national aſſembly, however, acted with much coolneſs. They inſtantly took upon themſelves the government, and decreed their ſittings permanent. They ſent meſſengers, at the ſame time, in all directions, to attempt to lay hold of the fugitives. Theſe had taken different routs. Monſieur and madame arrived ſafely at Bruſſels on the 23d. The king, queen, and their children, when they came to a conſiderable diſtance from the capital, were furniſhed by Bouillé with a guard of dragoons, under pretence of protecting treaſure for the pay of the troops. At the diſtance of 156 miles, and when only a few leagues from the frontiers, they were arreſted at St Menehould by the poſtmaſter, M. Drouet, formerly a dragoon in the regiment of Condé. At half paſt ſeven o'clock in the evening the carriages ſtopt to change horſes at his houſe; he thought he recollected the queen, and imagined that the king's face reſembled the impreſſions ſtamped upon aſſignats. The eſcort of dragoons increaſed the ſuſpicion. He ſuffered them to depart at 11 o'clock without notice; but taking a companion with him, he went by a ſhorter road to Varennes. With the aſſiſtance of the poſtmaſter there he gave the alarm, and overturned a carriage on the bridge, which detained the royal travellers till the national guard of the place had aſſembled, and the arreſt was effected without bloodſhed. They were brought back to Paris by a deputation from the aſſembly. At his departure, the king had imprudently left behind him a memorial, in which he declared, that he never had thought any ſacrifice too great for the reſtoration of order; but that the deſtruction of the kingdom, and the triumph of anarchy, being the only reward of all his efforts, he thought it neceſſary to depart from it. He then takes a review of the faults of the new conſtitution, the grievances he has ſuffered; and proteſts againſt every thing that he had been compelled to do during his captivity.

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290 The king, queen, and royal family, leave Paris.

291 Monſieur and madame arrive at Bruſſels.

292 The king and queen arreſted at Varennes.

293 Conſequences of this unfortunate flight.

Different parties were very differently affected by this ill-conducted and unfortunate flight of the king. A ſmall republican party had already begun to appear, and during the king's abſence, attempts were made to induce the public at large to conſider the royal authority as no neceſſary part of a free conſtitution. But the minds of men were by no means prepared for the reception of this new doctrine. The idea, however, having been thus publicly propoſed, left ſome impreſſions, which in time contributed to give riſe to important events. By far the greater number of leading men, however, were at preſent convinced, that it was impoſſible to conduct a great empire like France, well and proſperouſly, without the aſſiſtance of an hereditary chief. They therefore determined to paſs over the affair with as much ſilence as poſſible, and to haſten the period when their new conſtitution ſhould be complete. But there is reaſon to believe, that this journey was at the long-run highly inſtrumental in producing very fatal effects to the perſonal ſafety of the monarch.

His flight ſeemed a ſignal for emigration. Many of the ariſtocratic party ſent in reſignations of their ſeats in the national aſſembly. Troops were levied on the frontiers in the king's name; who took care, however, to diſavow any connexion with ſuch a procedure. Bouillé emigrated, and afterwards ſent to the aſſembly a furious threatening letter: "You ſhall anſwer (ſays he) for the lives of the king and of the queen to all the monarchs of the univerſe. Touch but a ſingle hair of their heads, and not one ſtone ſhall be left upon another in Paris. I know the roads. I will conduct the foreign armies. This letter is but the forerunner of the manifeſto of the ſovereigns of Europe."

A conſiderable calm throughout France followed theſe events, and it might be regarded as in a ſtate of tranquillity. It contained, indeed, parties entertaining much animoſity againſt each other, and many citizens had withdrawn to foreign countries; but the peace was not broken, and moderate men hoped that much proſperity would follow from the late agitations. But this calm was deluſive; and in the midſt of it thoſe projects were formed which were afterwards to prove ſo fatal to the peace of France and of Europe. Towards the cloſe of this ſummer, a convention took place at Pilnitz in Saxony between the emperor Leopold and the king of Pruſſia. Its object was not known at the time, but it gradually came into view, and is now by many underſtood

294 Treaty of Pilnitz.

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ſtood to have been intended for the purpoſe of concluding a league for the invaſion of France, the new-modelling of its government, and the partition of ſome of its faireſt provinces. The following paper has been repeatedly publiſhed as the copy of a treaty concluded and ſigned at Pavia, and is generally underſtood to have been identical with, and therefore known by, the name of the *Treaty of Pilnitz*. We are far from vouching for its authenticity. It may have been fabricated by the French aſſembly, to unite all parties in the nation againſt the foreign powers which threatened to invade them. But in ſtating the events of this revolution, it is perhaps ſtill more neceſſary, for the purpoſe of rendering the actions of men comprehenſible, to give an account of what was at the time *believed* to have occurred, than it now is to aſcertain what was actually true.

Partition Treaty between the Courts in Concert, concluded and ſigned at Pavia, in the Month of July 1791.

His majeſty the emperor will take all that Louis XIV. conquered in the Auſtrian Netherlands, will give them to his ſerene highneſs the elector Palatine; ſo that theſe new poſſeſſions, added to the Palatinate, may hereafter have the name of *Auſtraſia*.

His majeſty will preſerve for ever the property and poſſeſſion of Bavaria, to make in future an indiviſible maſs with the domains and hereditary poſſeſſions of the houſe of Auſtria.

Her ſerene highneſs the archduchess Maria Chriſtina ſhall be, conjointly with his ſerene highneſs her nephew the archduke Charles, put into hereditary poſſeſſion of the duchy of Lorraine.

Alſace ſhall be reſtored to the empire; and the biſhop of Straſbourg, as well as the chapter, ſhall recover their ancient privileges, and the eccleſiaſtical ſovereigns of Germany ſhall do the ſame.

If the Swiſs Cantons conſent to accede to the coalition, it may be propoſed to them to annex to the Helvetic league the biſhopric of Porentrui, the defiles of Franche Comté, and even thoſe of Tyrol, with the neighbouring bailiwicks, as well as the territory of Verſoy, which interſects the Pays de Vaud.

Should his majeſty the king of Sardinia ſubſcribe to the coalition, La Breſſe, Le Bugey, and the Pays de Gex, uſurped by France from Savoy, ſhall be reſtored to him.

In caſe his Sardinian majeſty can make a grand diverſion, he ſhall be ſuffered to take Dauphiné, to belong to him for ever as the neareſt deſcendant of the ancient dauphins.

His majeſty the king of Spain ſhall have Rouſſillon and Bearn, with the iſland of Corſica; and he ſhall have the French part of the iſland of St Domingo.

Her majeſty the empreſs of all the Ruſſias ſhall take upon herſelf the invaſion of Poland, and at the ſame time retain Kaminiech, with that part of Podolia which borders on Moldavia.

His majeſty the emperor ſhall oblige the Porte to give up Choceim, as well as the ſmall forts of Servia, and thoſe on the river Lurna.

His majeſty the king of Pruſſia, by means of the above-mentioned invaſion of the empreſs of all the Ruſſias into Poland, ſhall make an acquiſition of Thorn and Dantzic, and there unite the Palatinate on the eaſt to the confines of Sileſia.

His majeſty the king of Pruſſia ſhall beſides acquire Luſace; and his ſerene highneſs the elector of Saxony ſhall in exchange receive the reſt of Poland and occupy the throne as hereditary ſovereign. France. 1791.

His majeſty the preſent king of Poland ſhall abdicate the throne on receiving a ſuitable annuity.

His royal highneſs the elector of Saxony ſhall give his daughter in marriage to his ſerene highneſs the youngeſt ſon of his royal highneſs the grand duke of all the Ruſſias, who will be the father of the race of the hereditary kings of Poland and Lithuania. (Signed) Leopold. Prince Naſſau. Count Florida Blanca. Bischoffswerder.

295 The new conſtitution concluded by the aſſembly.

In the mean time, the national aſſembly was haſtening faſt to the completion of the new conſtitution. It was finiſhed on the 3d of September, and preſented to the king. It begins with the following declaration of the rights of a man and a citizen: and thereafter follow the different branches; the chief of which are here tranſlated.

I. All men are born, and remain, free and equal in rights: ſocial diſtinctions cannot be founded but on common utility.

II. The end of all political aſſociations is the preſervation of the natural and impreſcriptible rights of man: theſe rights are liberty, property, ſecurity, and reſiſtance againſt oppreſſion.

III. The principle of *ſovereignty* reſides eſſentially in the nation: *no body* of *men*, no *individual*, can exerciſe an authority that does not emanate expreſsly from that ſource.

IV. *Liberty* conſiſts in the power of doing every thing except that which is hurtful to another: hence the exerciſe of the natural rights of every man has no other bounds than thoſe that are neceſſary to enſure to the other members of ſociety the enjoyment of the ſame rights: thoſe bounds can be determined by the law only.

V. The law has a right to forbid thoſe actions alone that are hurtful to ſociety. Whatever is not forbidden by the law, cannot be hindered; and no perſon can be conſtrained to do that which the law ordaineth not.

VI. The law is the expreſſion of the general will: all the citizens have a right to concur perſonally, or by their repreſentatives, to the formation of the law: it ought to be the ſame for all, whether it protect, or whether it puniſh. All citizens being equal in the eye of the law, are equally admiſſible to dignities, places, and public offices, according to their capacity, and without any other diſtinction but that of their virtue and their talents.

VII. No man can be accuſed, arreſted, or detained, except in caſes determined by the law, and according to the forms which the law hath preſcribed. Thoſe who ſolicit, diſpatch, execute, or cauſe to be executed, arbitrary orders, ought to be puniſhed; but every citizen that is ſummoned or ſeized in virtue of the law, ought to obey inſtantly—he becomes culpable by reſiſtance.

VIII. The law ought to eſtabliſh ſuch puniſhments only as are ſtrictly and evidently neceſſary; and no perſon can be puniſhed but in virtue of a law eſtabliſhed and promulgated prior to the offence, and legally applied.

IX. Every man being preſumed innocent till ſuch time

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time as he has been declared guilty, if it ſhall be deemed abſolutely neceſſary to arreſt a man, every kind of rigour employed, not neceſſary to ſecure his perſon, ought to be ſeverely repreſſed by the law.

X. No perſon ſhall be moleſted for his opinions, even ſuch as are religious, provided that the manifeſtation of thoſe opinions does not diſturb the public order eſtabliſhed by the law.

XI. The free communication of thought, and of opinion, is one of the moſt precious rights of man. Every citizen, therefore, may freely ſpeak, write, and publiſh, his ſentiments; ſubject, however, to anſwer for the abuſe of that liberty, in caſes determined by the law.

XII. The guarantee of the Rights of Man and Citizens, involves a neceſſity of *public force:* this force is then inſtituted for the advantage of all, and not for the particular utility of thoſe to whom it is confided.

XIII. For the maintenance of public force, and for the expences of adminiſtration, a common contribution is indiſpenſably neceſſary: this contribution ſhould be equally divided amongſt all the citizens, in proportion to their abilities.

XIV. Every citizen has a right, by himſelf, or by his repreſentatives, to decide concerning the neceſſity of the public contribution; to conſent to it freely; to look after the employment of it; to determine the quantity, the diſtribution, the collection, and duration.

XV. The ſociety has a right to demand from every public agent an account of his adminiſtration.

XVI. Every ſociety, in which the guarantee of rights is not aſſured, nor the ſeparation of powers determined, has *no conſtitution.*

XVII. Property being a right inviolable and ſacred, no perſon can be deprived of it, except when the public neceſſity, legally aſcertained, ſhall evidently require it, and on condition of a juſt and previous indemnification.

The conſtitution guarantees, as natural and civil rights,

1. That all citizens are admiſſible to places and employments without any diſtinction, but that of ability and virtue.

2. That all contributions ſhall be divided equally among all the citizens, in proportion to their means.

3. That the ſame crimes ſhall be ſubject to the ſame puniſhments, without any diſtinction of perſons.

The conſtitution in like manner guarantees, as natural and civil rights,

Liberty to all men of going, ſtaying, or departing, without being arreſted, or detained, but according to the forms preſcribed by the conſtitution.

Liberty to all men of ſpeaking, writing, printing, and "publiſhing their thoughts, without having their writings ſubjected to any examination or inſpection before publication;" and of exerciſing the religious worſhip to which they are attached.

Liberty to all citizens of aſſembling peaceably, and without arms, complying with the laws of police.

Liberty of addreſſing to all conſtitutional authorities petitions individually ſigned.

The conſtitution guarantees the inviolability of property, or a juſt and previous indemnity for that of which public neceſſity, legally proved, ſhall require the ſacrifice.

A public inſtruction ſhall be created and organized, common to all citizens, gratuitous with regard to thoſe parts of tuition indiſpenſable for all men, and of which the eſtabliſhment ſhall be gradually diſtributed in a proportion combined with the diviſion of the kingdom. France. 1791.

"The kingdom is one and indiviſible;" its territory, for adminiſtration, is diſtributed into 83 departments, each department into diſtricts, each diſtrict into cantons.

Thoſe are French citizens,

Who are born in France, of a French father;

Who having been born in France of a foreign father, have fixed their reſidence in the kingdom.

Who having been born in a foreign country, of a French father, have returned to ſettle in France, and have taken the civic oath:

In fine, who having been born in a foreign country, being deſcended in whatever degree from a Frenchman or Frenchwoman, who have left their country from religious motives, come to reſide in France, and take the civic oath:

The right of French citizenſhip is loſt,

1ſt, By naturalization in a foreign country;

2dly, By being condemned to penalties which involve the civic degradation, provided the perſon condemned be not reinſtated;

3dly, By a ſentence of contumacy, provided the ſentence be not annulled;

4thly, By initiation into any foreign order or body which ſuppoſes either proofs of nobility "or diſtinctions of birth, or requires religious vows."

"The law conſiders marriage only as a civil contract."

The ſovereignty is one, indiviſible, "inalienable, and impreſcriptible," and it belongs to the nation: no ſection of the people, or individual, can arrogate the exerciſe of it.

The nation, from which alone flow all powers, cannot exerciſe them but by delegation.

The French conſtitution is repreſentative: the repreſentatives are the legiſlative body and the king.

The National Aſſembly, forming the legiſlative body, is permanent, and conſiſts of one chamber only.

It ſhall be formed by new elections every two years.

The legiſlative body cannot be diſſolved by the king.

The number of repreſentatives to the legiſlative body ſhall be 745, on account of the 83 departments of which the kingdom is compoſed; and independent of thoſe that may be granted to the colonies.

The repreſentatives ſhall be diſtributed among the departments, according to the three proportions of land, of population, and of the contribution direct.

Of the 745 repreſentatives 247 are attached to the land. Of theſe each department ſhall nominate three, except the department of Paris, which ſhall nominate only one.

Two hundred and forty-nine repreſentatives are attached to the population. The total maſs of the active population of the kingdom is divided into 249 parts, and each department nominates as many of the deputies as it contains parts of the population.

Two hundred and forty-nine repreſentatives are attached to the contribution direct. The ſum total of the direct contribution of the kingdom is likewiſe divided into 249 parts; and each department nominates as many deputies as it pays parts of the contribution.

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In order to form a legiſlative national aſſembly, the active citizens ſhall convene, in primary aſſemblies, every two years in the cities and cantons.

" The primary aſſemblies ſhall meet of full right on the firſt Sunday of March, if not convoked ſooner by the public officers appointed to do ſo by the law."

To be an active citizen, it is neceſſary,

To be a Frenchman, or to have become a Frenchman;

To have attained 25 years complete;

To have reſided in the city or the canton from the time determined by the law;

To pay in any part of the kingdom a direct contribution, at leaſt equal to the value of three days labour, and to produce the acquittance;

Not to be in a menial capacity, namely, that of a ſervant receiving wages;

To be inſcribed in the municipality of the place of his reſidence in the liſt of the national guards;

To have taken the civic oath.

The primary aſſemblies ſhall name electors in the proportion of the number of active citizens reſiding in the city or canton.

There ſhall be named one elector to the aſſembly, or not, according as there ſhall happen to be preſent 100 active citizens.

There ſhall be named two, when there ſhall be preſent from 151 to 250, and ſo on in this proportion.

The electors named in each department ſhall convene, in order to chooſe the number of repreſentatives, whoſe nomination ſhall belong to their department, and a number of ſubſtitutes equal to the third of the repreſentatives.

" The aſſemblies ſhall be held of full right on the laſt Sunday of March, if they have not been before convoked by the public officers appointed to do ſo by law."

All active citizens, whatever be their ſtate, profeſſion, or contribution, may be choſen repreſentatives of the nation.

Excepting, nevertheleſs, the miniſters and other agents of the executive power, &c.

The members of the legiſlative body may be re-elected to a ſubſequent legiſlature, but not till after an interval of one legiſlature.

No active citizen can enter or vote in an aſſembly if he is armed.

The repreſentatives ſhall meet on the firſt Monday of May, in the place of the ſittings of the laſt legiſlature.

The royalty is indiviſible, and delegated hereditarily to the race on the throne from male to male, by order of primogeniture, to the perpetual excluſion of women and their deſcendants.

Nothing is prejudged on the effect of renunciations in the race on the throne.

The perſon of the king is inviolable and ſacred; his only title is king of the French.

If the king put himſelf at the head of an army, and direct the forces of it againſt the nation, or if he do not oppoſe, by a formal act, any ſuch enterpriſe undertaken in his name, he ſhall be held to have abdicated.

If the king having gone out of the kingdom, do not return to it, after an invitation by the legiſlative body, within the ſpace which ſhall be fixed by the proclamation, " and which cannot be leſs than two months," he ſhall be held to have abdicated the royalty.

After abdication, expreſs or legal, the king ſhall be in the claſs of citizens, and may be accuſed and tried like them, for acts poſterior to his abdication.

The nation makes proviſion for the ſplendor of the throne by a civil liſt, of which the legiſlative body ſhall fix the ſum at the commencement of each reign, for the whole duration of that reign.

The king is a minor till the age of 18 complete; and during his minority there ſhall be a regent of the kingdom.

The regency belongs to the relation of the king, next in degree according to the order of ſucceſſion to the throne, who has attained the age of 25; provided he be a Frenchman reſident in the kingdom, and not preſumptive heir to any other crown, and have previouſly taken the civic oath.

The preſumptive heir ſhall bear the name of *Prince Royal.*

" The members of the king's family called to the eventual ſucceſſion of the throne, ſhall add the denomination of *French Prince* to the name which ſhall be given them in the civil act proving their birth; and this name can neither be patronymic nor formed of any of the qualifications aboliſhed by the preſent conſtitution.

" The denomination of *prince* cannot be given to any individual, and ſhall not carry with it any privilege or exception to the common right of all French citizens."

To the king alone belong the choice and diſmiſſion of miniſters.

" The members of the preſent national aſſembly, and of the ſubſequent legiſlatures, the members of the tribunal of appeal, and thoſe who ſhall be of the high jury, cannot be advanced to the miniſtry, cannot receive any place, gift, penſion, allowance, or commiſſion of the executive power or its agents during the continuance of their functions, or during two years after ceaſing to exerciſe them: the ſame ſhall be obſerved reſpecting thoſe who ſhall only be inſcribed on the liſt of high jurors as long as their inſcription ſhall continue."

No order of the king can be executed if it be not ſigned by him, and counterſigned by the miniſter or comptroller of the department.

In no caſe can the written or verbal order of a king ſhelter a miniſter from reſponſibility.

The conſtitution delegates excluſively to the legiſlative body the powers and functions following:

To propoſe and decree laws—The king can only invite the legiſlative body to take an object into conſideration;

To fix the public expences;

To eſtabliſh the public contributions, to determine the nature of them, the amount of each ſort, the duration, and mode of collection, &c.

War cannot be reſolved on but by a decree of the national aſſembly, paſſed on the formal and neceſſary propoſition of the king, and ſanctioned by him.

During the whole courſe of war, the legiſlative body may require the king to negotiate peace; and the king is bound to yield to this requiſition.

It belongs to the legiſlative body to ratify treaties of peace,

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peace, allianee, and commerce; and no treaty ſhall have effect but by this ratification.

The deliberations of the legiſlative body ſhall be public, and the minutes of the ſittings ſhall be printed.

The legiſlative body may, however, on any occaſion, form itſelf into a general committee.

The plan of a decree ſhall be read thrice, at three intervals, the ſhorteſt of which cannot be leſs than eight days.

The decrees of the legiſlative body are preſented to the king, who may refuſe them his conſent.

In caſe of a refuſal of the royal conſent, that refuſal is only ſuſpenſive.—When the two following legiſlatures ſhall ſucceſſively preſent the ſame decree in the ſame terms on which it was originally conceived, the king ſhall be deemed to have given his ſanction.

The king is bound to expreſs his conſent or refuſal to each decree within two months after its preſentation.

No decree to which the king has refuſed his conſent can be again preſented to him by the ſame legiſlature.

The ſupreme executive power reſides excluſively in the hands of the king.

The king is the ſupreme head of the land and ſea forces.

The king names ambaſſadors, and the other agents of political negociations.

He beſtows the command of armies and fleets, and the ranks of marſhal of France and admiral:

He names two-thirds of the rear-admirals, one-half of the lieutenant-generals, camp-marſhals, captains of ſhips, and colonels of the national gendarmerie:

He names a third of the colonels and lieutenant-colonels, and a ſixth of the lieutenants of ſhips:

He appoints in the civil adminiſtration of the marine, the directors, the comptrollers, the treaſurers of the arſenals, the maſters of the works, the under maſters of civil buildings, half of the maſters of adminiſtration, and the under maſters of conſtruction.

He appoints the commiſſaries of the tribunals:

He appoints the ſuperintendants in chief of the management of contributions indirect, "and the adminiſtration of national domains:"

He ſuperintends the coinage of money, and appoints officers entruſted with this ſuperintendance in the general commiſſion and the mints.

The effigy of the king is ſtruck on all the coinage of the kingdom.

There is in each department a ſuperior adminiſtration, and in each diſtrict a ſubordinate adminiſtration.

The adminiſtrators are ſpecially charged with diſtributing the contributions direct, and with ſuperintending the money ariſing from the contributions, and the public revenues in their territory.

The king has the right of annulling ſuch acts of the adminiſtrators of department as are contrary to the law or the orders tranſmitted to them.

He may, in caſe of obſtinate diſobedience, or of their endangering, by their acts, the ſafety or peace of the public, ſuſpend them from their functions.

The king alone can interfere in foreign political connections.

Every declaration of war ſhall be made in theſe terms: *By the king of the French in the name of the nation.*

The judicial power can in no caſe be exerciſed either by the legiſlative body or the king.

Juſtice ſhall be gratuitouſly rendered by judges choſen from time to time by the people, and inſtituted by letters patent of the king, who cannot refuſe them.

"The public accuſer ſhall be nominated by the people."

"The right of citizens to determine diſputes definitively by arbitration, cannot receive any infringement from the acts of the legiſlative power."

In criminal matters, no citizens can be judged except on an accuſation received by jurors, or decreed by the legiſlative body in the caſe in which it belongs to it to proſecute the accuſation.

After the accuſation ſhall be admitted, the fact ſhall be examined, and declared by the jurors.

The perſon accuſed ſhall have the privilege of challenging 20, "without aſſigning any reaſon."

The jurors who declare the fact ſhall not be fewer than 12.

The application of the law ſhall be made by the judges.

The proceſs ſhall be public; "and the perſon accuſed cannot be denied the aid of counſel."

No man acquitted by a legal jury can be apprehended or accuſed on account of the ſame fact.

For the whole kingdom there ſhall be one tribunal of appeal, eſtabliſhed near the legiſlative body.

A high national court, compoſed of members of the tribunal of appeal and high jurors, ſhall take cognizance of the crimes of miniſters, and the principal agents of the executive power; and of crimes which attack the general ſafety of the ſtate, when the legiſlative body ſhall paſs a decree of accuſation.

It ſhall not aſſemble but on the proclamation of the legiſlative body; "and at the diſtance of 30,000 toiſes at leaſt from the place of meeting of the legiſlative body."

The national guards do not form a military body, or an inſtitution in the ſtate; they are the citizens themſelves called to aſſiſt the public force.

Officers are choſen for a time, and cannot again be choſen till after a certain interval of ſervice as privates.

None ſhall command the national guard of more than one diſtrict.

All the parts of the public force employed for the ſafety of the ſtate from foreign enemies are under the command of the king.

Public contributions ſhall be debated and fixed every year by the legiſlative body, and cannot continue in force longer than the laſt day of the following ſeſſion, if they are not expreſsly renewed.

"Detailed accounts of the expence of the miniſterial departments, ſigned and certified by the miniſters or comptrollers-general, ſhall be printed and publiſhed at the commencement of the ſeſſions of each legiſlature.

"The ſame ſhall be done with the ſtatements of the receipt of the different taxes, and all the public revenues."

"The French nation renounces the undertaking of any war with a view of making conqueſts, and will never employ its forces againſt the liberty of any people.

The conſtituting national aſſembly declares, "That he-

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the nation has the impreſcriptible right of changing its conſtitution; and nevertheleſs conſidering that it is more conformable to the national intereſt to employ only by means provided in the conſtitution itſelf, the right of reforming thoſe articles of it, of which experience ſhall have ſhown the inconveniences, decrees, that the proceeding by an aſſembly of reviſion ſhall be regulated in the form following:

"When three ſucceſſive legiſlatures ſhall have expreſſed an uniform wiſh for the change of any conſtitutional article, the reviſion demanded ſhall take place.

"The next legiſlature, and the following, cannot propoſe the reform of any conſtitutional article.

"The fourth legiſlature, augmented with 249 members, choſen in each department, by doubling the ordinary number which it furniſhes in proportion to its population, ſhall form the aſſembly of reviſion."

The French colonies and poſſeſſions in Aſia, Africa, and America, "though they form part of the French empire," are not included in the preſent conſtitution.

With reſpect to the laws made by the national aſſembly which are not included in the act of conſtitution, and thoſe anterior laws which it has not altered, they ſhall be obſerved, ſo long as they ſhall not be revoked or modified by the legiſlative power.

296 And accepted by the king.

On the 13th of September the king announced, by a letter to the preſident of the aſſembly, his acceptance of the conſtitution. This event was ordered to be notified to all the foreign courts, and the aſſembly decreed a general amneſty with reſpect to the events of the revolution. On the following day the king repaired in perſon to the national aſſembly; and being conducted to a chair of ſtate prepared for him at the ſide of the preſident, he ſigned the conſtitutional act, and took an oath of fidelity to it. He then withdrew, and was attended back to the Thuilleries by the whole aſſembly, with the preſident at their head. On the 30th of September, this national aſſembly, which has ſince been known by the name of the *Conſtituent Aſſembly*, diſſolved itſelf, and gave place to the ſucceeding *Legiſlative National Aſſembly*, which had been elected according to the rules preſcribed by the new conſtitution.

297 The aſſembly diſſolved.

298 Character and labours of the conſtituent aſſembly.

On the character and the labours of the *Conſtituent Aſſembly*, we ſhall only remark, that it contained many men of talents, and, in all probability, a conſiderable number of men of integrity. Towards the cloſe of its ſeſſion, it aſſumed a very ſtriking character of moderation, and appears to have been completely monarchical, although its jealouſy of the ancient ariſtocracy prevented it from ſufficiently guarding the throne againſt popular violence: for a very ſtriking defect in the new conſtitution ſoon appeared. The king poſſeſſed a *veto*, or negative, upon the reſolutions of the legiſlative body: but this negative he was bound to exerciſe in *perſon*, without reſponſibility, and without the intervention of his miniſters. He had no ſenate, or upper chamber, to ſtand between him and popular violence; and there was ſomething apparently abſurd in ſetting the vote of an individual in oppoſition to the collective wiſdom and will of a whole nation. In conſequence of this, he was reduced to the hard alternative of yielding to every vote of the national aſſembly, or of expoſing himſelf perſonally to public odium.

The new aſſembly was opened by the king on the 7th of October, with much apparent union on all ſides. His ſpeech, recommending unanimity and confidence between the legiſlative and executive powers, was received with unbounded applauſe. The character of the men who compoſed the new national aſſembly was unauſpicious to the Court. At the commencement of the revolution, the great body of the people at a diſtance from the capital were little intereſted in thoſe projects of freedom which occupied the more enlightened or more turbulent inhabitants of Paris. They had gradually, however, been rouſed from their lethargy. The variety of powers conferred by the new conſtitution upon the people at large, and the multiplicity of offices of which it gave them the patronage, had kindled in the minds of men a love of dominion, and a wiſh to interfere in public affairs. This attached them to the new order of things. The love of power, which is the leaſt diſguiſed paſſion in the human heart, and equally ſtrong in the breaſt of the meaneſt and of the higheſt of mankind, was thus, under the name of liberty, become a leading paſſion throughout this wide empire. They who flattered it moſt, and were moſt loud in praiſe of the rights of the people, became ſpeedily the favourites of the public. The conſequence of this was, that the new national aſſembly was chiefly compoſed of country gentlemen, of principles highly democratic, or of men of letters who had publiſhed popular books, or conducted periodical publications. The members of the conſtituent aſſembly had been excluded by their own decree from holding ſeats in the new legiſlature.—The members of the latter, therefore, had little regard for a conſtitution which they themſelves had not framed, and which was not protected by the venerable ſanction of antiquity.

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299 The new aſſembly opened by the king. Character of the members.

When this aſſembly firſt met, it ſhowed a very trifling attention to formalities, and a peeviſh jealouſy of the miniſters of the crown. In the mean time, the treaty of Pilnitz, already mentioned, began to be rumoured abroad, and France was thrown into a ſtate of anxious jealouſy for the ſafety of its newly-acquired liberties. Although the Pruſſians and Germans (the elector of Mentz alone excepted) all continued to temporize, the northern powers, Sweden and Ruſſia, entered into ſtrict engagements to reſtore the old deſpotiſm of France. On the 9th of November, a decree was paſſed, that the emigrants who, after the firſt of January next, ſhould be found aſſembled, as at preſent, in a hoſtile manner, beyond the frontiers, ſhould be conſidered as guilty of a conſpiracy, and ſuffer death; that the French princes, and public functionaries, who ſhould not return before that period, ſhould be puniſhable in the ſame manner, and their property forfeited during their own lives. On the 18th, a ſeries of ſevere decrees was alſo paſſed againſt ſuch of the ejected clergy as ſtill refuſed to take the civic oath. To both theſe decrees the king oppoſed his *veto*, or negative.—The moderate party, who were attached to the conſtitution, rejoiced at this as a proof of the freedom of their ſovereign. But, on the other ſide, it excited a moſt violent clamour, and became the means of exciting new ſuſpicions of the wiſhes of the court. At this time anſwers were received from the different foreign courts to the notification ſent them of the king's acceptance of the new conſtitution. Theſe were generally conceived in a ſtile of caution, and avoided giving

300 Their jealouſy of the miniſters of the crown.

301 Pacific anſwers are received from foreign powers.

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open offence. The emperor even prohibited all aſſemblages of emigrants within his ſtates; and the king intimated to the aſſembly that he had declared to the elector of Treves, that unleſs the emigrants ſhould ceaſe before the 15th of January to make hoſtile preparations within his territories, he would be conſidered as the enemy of France. All this, however, did not preſerve the court from ſuſpicion; for although the different foreign courts had openly declared pacific intentions, yet the French emigrants boldly aſſerted that all Europe was actually arming in their favour. Accordingly they ceaſed not to ſolicit their equals in rank, who ſtill remained within the country, to leave it to join with them in what they called the *royal cauſe*.—The unhappy Louis, placed between a republican party that was gradually gathering ſtrength, and an ariſtocratical party that was rouſing Europe to arms againſt a nation of which he was the conſtitutional chief, and a combination of princes juſtly ſuſpected of wiſhing to ſeize upon a part of his dominions, ſtood in a ſituation which would have perplexed the moſt ſkilful ſtateſman; and it is no proof of incapacity that he fell a ſacrifice to circumſtances which might have overwhelmed any known meaſure of human ingenuity. Addreſſes were crowding into the aſſembly, diſapproving the conduct of the court. M. Montmorin reſigned; M. Deleſſart ſucceeded him; and M. Cahier de Gerville became miniſter of the interior. M. du Portail reſigned alſo, and M. Narbonne ſucceeded him as miniſter of war. In the month of November, M. Bailly's mayoralty terminated; and the once popular La Fayette appeared as a candidate to ſucceed him. But he was ſucceſsfully oppoſed by M. Petion, a violent Jacobin, and a declared republican, who was elected mayor of Paris by a great majority.

302 But the court is ſtill ſuſpected.

303 he miniſtry changed.

304 The Feuillans eſtabliſhed to oppoſe the Jacobin club.

At this period the moderate men, who were friends of the conſtitution, attempted to counteract the influence of the Jacobin club by the eſtabliſhment of a ſimilar one. It derived its name from the vacant convent of the *Feuillans*, in which it aſſembled. The moſt active members of the Conſtituent Aſſembly belonged to it, ſuch as M. M. D'Andre, Barnave, the Lameths, Du Port, Rabaud, Sieyes, Chapelier, Thouret, Labord, Taleyrand, Monteſquieu, Beaumetz, &c. The Jacobins contrived to excite a riot at the place of their meeting, which was in the vicinity of the hall of the National Aſſembly. This afforded a pretext for applying to the aſſembly for the removal of the new club. The aſſembly ſhowed their diſpoſition, by complying with this requeſt.

305 State of France in the end of 1791 and beginning of 1792.

At the end of this year, the kingdom of France was by no means proſperous. The public revenue had fallen far ſhort of the expenditure. The emigrant nobility had carried out of the kingdom the greater part of the current coin; and a variety of manufacturers, who depended upon their oſtentatious luxury, were reduced to much diſtreſs. The diſpoſitions of foreign courts appeared very doubtful. The new year, however, opened with deluſive proſpects of tranquillity.—The German princes appeared ſatisfied with the mode of compenſation which the French had offered for the loſs of their poſſeſſions in Alſace and Lorraine. The prince of Loweſtein accepted of an indemnification.—The princes of Hohenlohé and Salm-Salm declared themſelves ready to treat upon the ſame terms. Prince Maximilian, and the dukes of Wirtemberg and Deux-Ponts, freely negociated. It is unneceſſary to ſtate in detail the ſubterfuges employed, in the mean time, by the crafty Leopold, for amuſing the French with the appearances of peace. M. Deleſſart, miniſter for foreign affairs, fell a ſacrifice to them, and probably to the undecided character of Louis. He was accuſed by M. Briſſot of not having given timely notice to the National Aſſembly of the diſpoſitions of foreign powers, and of not preſſing proper meaſures for ſecuring the honour and ſafety of the nation. A decree of accuſation paſſed againſt him in his abſence. He was apprehended, tried by the high national court at Orleans, and executed in conſequence of its ſentence.

306 The death of the emperor and murder of the king of Sweden.

The ſudden death of Leopold on the firſt of March gave riſe to a tranſient hope that peace might ſtill be preſerved. A ſuſpicion of poiſon fell upon the French, but it was removed by the detail of his diſeaſe that was ſpeedily publiſhed. On the 16th of the ſame month, the king of Sweden was wounded by a nobleman of the name of Ankerſtrom, and died on the 29th. This enterpriſing prince had overturned the conſtitution of his own country, and he had formed the project of conducting in perſon his troops to the frontiers of France, and of commanding or accompanying the combined armies of Europe in their attempt to avenge the cauſe of inſulted royalty. It was in a great meaſure to counteract this ſcheme that he was aſſaſſinated.

307 The emperor's ſucceſſor openly avows warlike intentions.

The ſudden fall, however, of theſe two enemies rather accelerated than retarded the meditated hoſtilities. The young king of Hungary, who ſucceeded to the empire, made no ſecret either of his own intentions or of the exiſtence of a *concert of Princes* againſt France. M. Dumourier was now at the head of the war-office, M. Roland was miniſter of the interior, and M. Claviere miniſter of finance. The Jacobins were all powerful. The court gave way to the torrent. The property of the emigrants was confiſcated, reſerving the rights of creditors. The Imperial miniſter, Prince Kaunitz, demanded three things of France; 1ſt, The reſtitution of their feudal rights to the German princes; 2dly, To reſtore Avignon to the Pope, the inhabitants of which had ſome time before thrown off their allegiance, and prevailed with the conſtituent aſſembly to receive their country as a part of France; and laſtly, Prince Kaunitz demanded, that "the neighbouring powers ſhould have no reaſon for apprehenſion from the preſent weakneſs of the internal government of France." On receiving theſe demands, the king propoſed a declaration of war, which was decreed by the National Aſſembly on the 20th of April, againſt *the King of Hungary and Bohemia*.

308 And the Auſtrian Netherlands are unſucceſsfully attacked by the French.

The French immediately began the war, by attacking in three different columns the Auſtrian Netherlands. M. Theobald Dillon advanced from Liſle to Tournay, where he found a ſtrong body of Auſtrians ready to receive him. The national troops, unaccuſtomed to ſuſtain the fire of regular ſoldiers, were inſtantly thrown into confuſion, and fled even to the gates of Liſle. The cry of *treaſon* reſounded on all ſides; and their commander, an experienced and faithful officer, was murdered by his own ſoldiers and the mob. A ſecond diviſion of 10,000 men, under Lieutenant-General Biron, took poſſeſſion of Quiverain on the 29th, and marched towards Mons. General Biron was here attacked by the

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the Auſtrians, whom he repulſed. Hearing, however, of the defeat of Dillon, he retreated. A third party advanced to Furnes, but afterwards withdrew. La Fayette at the ſame time advanced towards Bouvines, half way to Namur, from which he afterwards retreated. The whole of theſe expeditions were ill contrived, in as much as they divided the French undiſciplined troops, and expoſed them in ſmall bodies to the attack of veteran forces. The Auſtrians were ſome time before they attempted to retaliate. At length, however, on the 11th of June, they attacked M. Gouvion, who commanded the advanced guard of La Fayette's army near Maubeuge. M. Gouvion was killed by a rolling bullet; but La Fayette himſelf having come up, the Auſtrians abandoned the field. In the mean time, matters were haſtening in Paris towards a violent criſis.

309 Two parties in Paris at this period, and the conſequences.

Two parties, both of which were hoſtile to the preſent conſtitution, had gradually been formed in the ſtate. The one wiſhed to give more effectual ſupport to the royal authority, by eſtabliſhing a *ſenate* or *two chambers*, to prevent the king's vote from being the ſole check upon popular enthuſiaſm. The other party wiſhed to ſet aſide royalty altogether, and to hazard the bold experiment of converting France into a republic. Theſe laſt were ſupported by the Jacobin club, which had now contrived to concentrate in itſelf an immenſe maſs of influence. Innumerable popular ſocieties were eſtabliſhed in every town and village throughout the provinces. With theſe a regular correſpondence was kept up by writing and by emiſſaries. Thus ſchemes and notions were inſtantaneouſly propagated through a great empire, and all the violent ſpirits which it contained were enabled to act in concert: But the more immediate engine of the republican party conſiſted of the immenſe population of the metropolis, whom they now endeavoured to keep in conſtant alarm. For this purpoſe they alleged, that an *Auſtrian Committee*, that is to ſay, a conſpiracy in favour of the enemies of the country, exiſted among the friends of the court. M. M. Genſonné and Briſſot even offered in the aſſembly to prove the exiſtence of this pretended Auſtrian committee. A report was next circulated, that the king intended to abſcond from the capital on the 23d of May. His majeſty publicly contradicted theſe accuſations as calumnies, but they made no ſmall impreſſion upon the minds of the public. New decrees were now made againſt the refractory clergy, but theſe his majeſty refuſed to ſanction. A propoſal was alſo made and decreed in the aſſembly to form a camp of 20,000 men under the walls of Paris, and that for this levy every canton in the kingdom ſhould contribute one horſeman and four infantry. The national guard of Paris diſliked the propoſal, and the king gave to it his negative. Indeed at this time the king ſeems to have come to a reſolution of ſtanding out againſt the Jacobin party, to which he had for ſome time yielded. The miniſtry were therefore diſmiſſed, excepting M. Dumourier, and others were appointed in their ſtead. By this event Dumourier loſt the confidence of the Jacobin club. He ſaw his error, reſigned his office, and joined the army. In the mean time a decree had been paſſed, authoriſing the manufactory of pikes for the purpoſe of arming cheaply the lower claſs of citizens. All means were uſed to render the king odious by inflammatory writings and harangues; and in both of theſe the noted incendiary Marat took the lead.

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On the 20th of June, M. Roederer, the procureur general ſyndic informed the national aſſembly, that, contrary to law, formidable bodies of armed men were preparing to preſent petitions to the king, and to the national aſſembly. A part of them ſpeedily appeared with St Huruge and Santerre a brewer at their head. They marched through the hall in a proceſſion that laſted two hours, at four o'clock in the afternoon, to the number of about 40,000. They ſurrounded the Thuilleries. The gates were thrown open; and on an attempt to break the door of the apartment where the king then was, he ordered them to be admitted. His ſiſter the princeſs Elizabeth never departed from his ſide during four or five hours that he was ſurrounded by the multitude, and compelled to liſten to every indignity. All this while Petion, the mayor of Paris, was unaccountably abſent. He at length, however, arrived, and alſo a deputation from the aſſembly. The queen, with her children and the princeſs de Lamballe, were in the mean time in the council-chamber, where, though protected from violence, they were yet expoſed to much inſult. At laſt, in conſequence of the approach of evening, and of the entreaties of Petion, the multitude gradually diſperſed.

310 An armed mob marches through the aſſembly, &c.

311 The more reſpectable inhabitants are aſhamed of ſuch conduct.

The indignities ſuffered on this day by the royal family were in ſome reſpects not unfavourable to their cauſe. A great number of the moſt reſpectable inhabitants of the capital were aſhamed of ſuch proceedings. They complained of them ſeverely in a petition to the aſſembly, and addreſſes to the ſame purpoſe were received from ſeveral departments. The directory of the department of Paris, at the head of which were M. Rochefoucault and M. Talleyrand, publiſhed a declaration diſapproving of the conduct of the mayor, and of M. Manuel the procureur of the commune, whom they afterwards ſuſpended from their offices, although they were ſpeedily reſtored by a decree of the aſſembly. At the ſame time, La Fayette leaving his army ſuddenly, appeared on the 26th at the bar of the national aſſembly. He declared that he came to expreſs the indignation which the whole army felt on account of the events of the 20th: he called upon the aſſembly to puniſh the promoters of theſe events, and to diſſolve the factious clubs. The ſudden appearance of La Fayette threw the Jacobins into conſternation, and from that period they never ceaſed to calumniate him.

312 The king of Pruſſia marches againſt France.

On the 1ſt of July, on the motion of M. Jean de Brie, the aſſembly ordered a proclamation to be made, that *the country was in danger*. On the 6th, the king gave intimation that the king of Pruſſia was marching with 52,000 men to co-operate againſt France. The French arms were at this time ſomewhat ſucceſsful in the Auſtrian Netherlands; but the cabinet ſpeedily thought it neceſſary to order the armies to retreat: a meaſure which was afterwards publicly cenſured by Marſhal Luckner.

313 Moderate ſpeech of the biſhop of Lyons.

On the 7th, a ſingular ſcene occurred in the national aſſembly. At the inſtant that M. Briſſot was about to commence an oration, M. Lammourette biſhop of Lyons requeſted to be heard for a few minutes. He expatiated on the neceſſity of union among the members of the aſſembly, and of ſacrificing their paſſions and prejudices

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judices on the altar of their country. He concluded an animated addreſs with theſe words, "Let all who hold in equal deteſtation a republic and two chambers, and who wiſh to maintain the conſtitution as it is, riſe!" The words were ſcarcely pronounced when the whole aſſembly ſtarted from their ſeats. Men of all parties ſolemnly embraced each other, and proteſted their adherence to the conſtitution. A deputation announced this happy event to the king; who immediately came and congratulated them in a ſhort ſpeech, which was received with infinite applauſe. The only good effect, however, produced by this temporary agreement was, that the feſtival of the 14th of July, which was celebrated with the uſual magnificence, paſſed over in tranquillity.

314 Manifeſto of the duke of Brunſwick.

On the 25th of July, the duke of Brunſwick iſſued at Coblentz his celebrated manifeſto. It declared the purpoſe of the intended invaſion of France to be the reſtoration of the French king to full authority. It declared the national guard of France reſponſible for the preſervation of tranquillity; and threatened with the puniſhment of death, as rebels to their king, thoſe who ſhould appear in arms againſt the allied powers. All men holding offices, civil or military, were threatened in the ſame manner, as well as the inhabitants of all cities. The city of Paris in particular, and the national aſſembly, were declared reſponſible for every inſult which might be offered to the royal family. It was declared, that if they were not immediately placed in ſafety, the allies were reſolved to inflict "on thoſe who ſhould deſerve it the moſt exemplary and ever memorable avenging puniſhments, by giving up the city of Paris to military execution, and expoſing it to total deſtruction; and the rebels who ſhould be guilty of illegal reſiſtance ſhould ſuffer the puniſhments which they ſhould have deſerved." This ſanguinary and imprudent manifeſto operated as a warrant for the deſtruction of the unfortunate Louis XVI. It left no middle party in the nation. All who wiſhed to preſerve freedom in any form, and all who loved the independence of their country, were inſtantly united. At the ſame time, the reproaches caſt on the king by the Jacobins now gained univerſal credit. The kings of Pruſſia and of Hungary told the French nation, that their monarch was ſecretly hoſtile to the conſtitution; and the reſtoration of him and his family to deſpotic power was made the ſole pretence for a bloody and dangerous war.

315 Injurious to Louis.

316 But advantageous to the republican party, who reſolve to depoſe him.

The republican party ſaw the advantage which they had now gained, and reſolved upon the depoſition of the king. The chief engine which they meant to employ in this ſervice conſiſted of about 1500 men, who had come to Paris at the period of the confederation on the 14th of July, and therefore called *fœderés*, and who were alſo ſometimes denominated *Marſeillois*, from the place from which the greater number of them came. Next to theſe, dependence was placed in the populace of the ſuburbs of the capital. The deſigns of the republicans were not unknown to the court, and both parties were forming plans of operation. It is ſaid that the royal party intended that the king and his family ſhould ſuddenly leave the capital, and proceed to as great a diſtance as the conſtitution permitted. The republicans are ſaid to have intended to ſeize the perſon of the king, and to confine him in the caſtle of Vincennes till a national convention ſhould decide upon his fate. Both allegations are probably true. Every motive which can influence the mind of man muſt have induced Louis to wiſh to be at a diſtance from the factious and ſanguinary capital. And the ſubſequent conduct of the republicans authoriſe us to believe them capable of the worſt crime that was laid to their charge.

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317 La Fayette accuſed and acquitted.

Various charges had been brought forward in the aſſembly againſt La Fayette, and the 8th of Auguſt was appointed for their diſcuſſion. In the mean time, on the 3d of Auguſt, Petion the mayor, at the head of a deputation from the ſections of Paris, appeared at the bar, and in a ſolemn ſpeech demanded the depoſition of the king. The diſcuſſion of the accuſation againſt La Fayette was conſidered as a trial of ſtrength between the parties: he was acquitted, however, by a majority of nearly 200; and the republican party, deſpairing of carrying their point by a vote of the national aſſembly, reſolved to have recourſe to inſurrection and force.

318 Horrid plot of the republicans.

On the evening of the 9th of Auguſt, about 1500 gentlemen, officers of the army, and others, repaired to the palace, reſolved to protect the royal family or to die in their defence: added to theſe were 700 Swiſs guards, with a body of cavalry amounting to about 1000. Mandat, the commander of the national guards, a man who was firmly attached to the conſtitution, had procured 2400 of that body and 12 pieces of cannon. With ſuch a force, it has been generally thought that, by vigorous and ſteady councils, the palace, which is a kind of caſtle, might have been ſucceſsfully defended; and what is now called a revolution might have born the name of a rebellion. Meanwhile the aſſembly declared its ſittings permanent. Petion was at the palace late on the evening of the 9th. Some apprehenſions were entertained, or pretended to be entertained, for his ſafety (for the whole of this buſineſs was, on the part of the republicans, the moſt infernal plot), and a deputation from the aſſembly brought him away. At midnight the toſin or alarm bell was ſounded, and the drums beat to arms through the city. At this inſtant a number of the moſt active leaders of the republican party aſſembled, and elected a new common council or *commune*. The perſons thus irregularly choſen inſtantly took poſſeſſion of the common hall, and drove out the lawful members; who, with that weakneſs with which men are apt to ſhrink from ſtations of reſponſibility in perilous times, readily gave place to the uſurpers. The new commune ſent repeated meſſages to M. Mandat, requiring his attendance upon important buſineſs. He was occupied in arranging the troops in the beſt order around the palace; but ſuſpecting nothing, he went to the common hall, and was there aſtoniſhed to find a different aſſembly from what he expected. He was abruptly accuſed of a plot to maſſacre the people, and ordered to priſon; but as he deſcended the ſtairs, he was ſhot with a piſtol, and Santerre was appointed in his ſtead to command the national guard.

On this eventful night no perſon in the palace went to bed. About ſix o'clock in the morning of the 10th the king deſcended into the gardens to review the troops. He was received with ſhouts of *Vive le roi*, excepting from the artillery, who ſhouted *Vive le nation*. The king returned to the palace, and the multitude continued to collect. The national guard ſeemed undetermined about what they were to do, as they aſſembled in diviſions near the palace; and had a ſteady reſiſtance

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sistance been made from within, it is probable they would have joined the royal party. But towards eight o'clock M. Roederer procured admittance to the palace, and told the king that armed multitudes were assembling in hostile array around the Thuilleries; that the national guard was not to be depended upon; and that, in case of resistance, the whole royal family would most certainly be massacred. He therefore advised the king to seek protection in the hall of the national assembly. With this advice the king, with his usual facility of temper, was ready to comply; but the queen opposed with vehemence the humiliating proposal. Becoming gradually, however, alarmed for the safety of her children, she gave her consent; and the king and queen, the princess Elizabeth, with the prince and princess royal, went on foot to the hall of the assembly. "I am come hither (said his majesty) to prevent a great crime. Among you, gentlemen, I believe myself in safety." By an article of the constitution the assembly could not deliberate in presence of the king. The royal family were, therefore, placed in a narrow box separated from the hall by a railing, where they remained for 14 hours without any place to which they could retire for refreshment, excepting a very small closet adjoining. Here they sat listening to debates, in which the royal character and office were treated with every mark of insult.

219 The royal family fly for safety to the hall of the national assembly.

When the king left the palace of the Thuilleries, he unfortunately forgot to order it to be immediately surrendered. He recollected this as soon as he reached the assembly, and sent orders for this purpose; but it was now too late. The insurgents amounted to about 20,000 effective men. They were drawn up in tolerable order by Westerman a Prussian, and had about 30 pieces of cannon along with them. The gentlemen within the palace, who had assembled to protect the king's person, were now dispirited, and knew not what part to act. The commander of the Swiss, M. Affry, was absent, and the captains knew not what to do; and the national guard had no leader in consequence of the death of Mandat. About nine o'clock the outer gates were forced open; and the insurgents formed their line in front of the palace. A bloody combat commenced chiefly between the Marseillois and the Swiss. After a brave resistance of about an hour, the Swiss were overpowered by numbers, and gave away. All of them that could be found in the palace were massacred; some even while imploring quarter on their knees. Others escaped into the city, and were protected by individuals. Of this brave regiment, however, only 200 survived; but every human being, even the lowest servants found in the palace, were put to death. The Swiss taken prisoners in various quarters were conducted to the door of the assembly, and taken by a decree under the protection of the state. But the sanguinary multitude insisted upon putting them to instant death; and the assembly would, in all probability, have been unable to protect them, had not the Marseillois interfered in their favour.

320 A bloody conflict in the palace, in which most of the Swiss-guards are massacred.

The suspension of the royal authority was now decreed, and the nation was invited to elect a *Convention* to determine the nature of its future government. On this uncommon occasion all Frenchmen of 21 years of age were declared capable of electing, and of being elected, deputies to the new national convention. Commissioners were, in the mean time, sent on the same evening to give to the armies a false and favourable account of these transactions. The royal family were sent to the old palace of the Temple in the midst of the city, to remain there under a strict guard; and all persons of rank who had been attached to them were seized and committed to the different prisons.

321 The royal authority suspended, and royal family imprisoned.

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To give an idea of the temper of the people of Paris at this time, it is proper to remark, that at the same instant when the multitude with a bloody fury was massacring the menial servants in the palace, and could scarcely be restrained from offering violence to the Swiss who were made prisoners, they would suffer no act of pillage to pass unpunished. Several attempts of this kind were accordingly followed by the instant death of the criminals. The plate, the jewels, and money found in the Thuilleries were brought to the national assembly, and thrown down in the hall. One man, whose dress and appearance bespoke extreme poverty, cast upon the table an hat full of gold. But the minds of these men were elevated by enthusiasm; and they conceived themselves at this moment the champions of freedom, and object of terrors to the kings of the earth.

322 Bloody temper of the people of Paris, &c.

In the mean time, the situation of France was extremely critical, and it appeared very doubtful if the new convention would ever be suffered to assemble. La Fayette had accidentally got speedy notice of the events of the 10th of August. He advised the magistrates of the town of Sedan to imprison the commissioners from the national assembly when they should arrive there; which was accordingly done. He, at the same time, published an address to his army, calling upon them to support the king and the constitution; but finding that they were not to be depended upon, on the 19th of August he left the camp in the night, accompanied only by his staff and a few servants. They took the route of Rochefort in Liege, which was a neutral country; but were met by a party of the enemy, who took them prisoners, and La Fayette was detained for several years in Prussian and Austrian dungeons. The severe treatment of this man was probably a considerable error in policy on the part of the allies. His fidelity to his king is very generally admitted; though some have entertained strong suspicions of his having acted a very base part to that unfortunate monarch; and in the British house of commons he has been called an abandoned ruffian. The expression is certainly too strong. His errors seem to have been those of the head rather than of the heart; and at all events, he should have been protected by the allies, if for no other reason than to encourage subsequent desertions among the officers of the republican army.

323 Critical situation of the whole kingdom.

324 La Fayette withdraws from the army—His fate and character.

To return from this digression. The commissioners were soon set at liberty at Sedan, and received with applause by the army of La Fayette. General Arthur Dillon at first entered into the sentiments of La Fayette; but the politic Dumourier diverted him from his purpose, and by this means regained his credit with the Jacobins, and was appointed commander in chief. The other generals, Biron, Montesquieu, Kellerman, and Custine, made no opposition to the will of the national assembly.

Meanwhile, the combined armies of Austria and Prussia had entered France. The duke of Brunswick's army

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army was above 50,000 ſtrong. General Clairfait had joined him with 15,000 Auſtrians, and a conſiderable body of Heſſians, along with 20,000 French emigrants; amounting in all to 90,000 men. To oppoſe theſe, Dumourier had only 17,000 men collected near the point from which the enemy were approaching in Luxembourg. The French emigrants had given the duke of Brunſwick ſuch an account of the diſtracted ſtate of their own country, and of the pretended diſaffection of all orders of men towards the ruling faction in Paris, that no reſiſtance of any importance was expected. When the combined troops, conſiſting either of ſteady Auſtrian or Hungarian battalions, or of thoſe well diſciplined Pruſſians which the great Frederick had inured to the beſt military diſcipline, were reviewed in Germany before ſetting out on their march, it is ſaid that the ſpectators, among whom the French cauſe was not unpopular, beheld them with anxiety and regret, and pitied the unhappy country againſt which this irreſiſtible force was directed. The ſoldiers and their officers regarded themſelves as departing for a hunting match, or an excurſion of pleaſure; and many of the uſual accommodations of an army were ill attended to, ſuch as hoſpitals, &c. The beginning of their progreſs into France juſtified theſe expectations. Longwy ſurrendered after a ſiege of 15 hours, although well fortified, poſſeſſed of a garriſon of 3500 men, and defended by 71 pieces of cannon. The news of this event irritated the aſſembly ſo much, that they decreed, that, when retaken, the houſes of the citizens ſhould be razed to the ground; and, diſtruſtful of the officers of the army, they decreed that the municipal officers of a town ſhould hereafter have power to controul the deliberation of the council of war. Verdun was next ſummoned; and here the municipality compelled the governor M. Beaurepaire to ſurrender. That officer, diſappointed and enraged, ſhot himſelf dead with a piſtol in preſence of the council, and on the 2d of September the Pruſſian troops entered the town.

325 The combined armies enter France in great force.

326 Alarm at Paris on account of their ſucceſs.

The news of this ſecond capture, and of the approach of the Pruſſians, ſpread an inſtant alarm through Paris. It was propoſed to raiſe a volunteer army, which ſhould ſet out immediately to meet the enemy. The common council, which was now led by Robeſpierre, Danton, Marat, and others of the moſt ſanguinary character, ordered the alarm-guns to be fired, and the populace to be ſummoned to meet in the Champ de Mars to enroll themſelves to march againſt the enemy. The people aſſembled, and either in conſequence of a premeditated plan, or, which is not very probable, of an inſtantaneous movement, a number of voices exclaimed, that "the domeſtic foes of the nation ought to be deſtroyed before its foreign enemies were attacked."

327 Horrid maſſacres.

Parties of armed men proceeded without delay to the priſons where the non-juring clergy, the Swiſs officers, and thoſe confined ſince the 10th of Auguſt on account of practices againſt the ſtate, were detained in cuſtody. They took out the priſoners one by one, gave them a kind of mock trial before a jury of themſelves, acquitted ſome few, and murdered the reſt. Among theſe laſt was the princeſs de Lamballe. She was taken from her bed before this bloody tribunal, and maſſacred; her head was carried by the populace to the Temple, to be ſeen by the queen, whoſe friend ſhe was. Theſe maſſacres laſted for two days, and upwards of 1000 perſons were put to death. There is ſcarce any thing in hiſtory that can be repreſented as parallel to them; they were committed, it is ſaid, by leſs than 300 men, in the midſt of an immenſe city, which heard of them with horror, and in the vicinity of the national aſſembly, which, by going in a body, could have put an end to them. But ſuch was the confuſion and diſmay of theſe two diſgraceful days, that no man dared to ſtir from his own houſe; and every one believed that the whole city, excepting his own ſtreet, was engaged in maſſacre and bloodſhed. The national guards were all ready at their reſpective poſts, but no man directed them to act: and there is too much reaſon to ſuſpect that Santerre and the chiefs of the commune connived, at leaſt, at the tranſaction. France. 1792.

328 State of the French army, and conduct of Dumourier.

In the mean time, General Dumourier was taking the beſt meaſures to protract the march of the enemy till the army of Kellerman, conſiſting of 20,000 men, could join him from Lorraine, and that of Bournonville from Flanders, amounting to 13,000; together with whatever new levies Luckner might be able to ſend him from Chalons. The foreſt of Argonne extends from north to ſouth upwards of 40 miles; it lay directly in the route of the duke of Brunſwick, who muſt either force his way acroſs it, or make a circuit of 40 miles by the paſs of Grandpre on the north, or by Barleduc on the ſouth. The paſs that lay directly in his route was that of Bieſme. After ſurveying Dillon's poſition here, he left a party of 20,000 men to watch it; and with the main body of his army took the circuitous rout by Grandpre on the north. Here Dumourier waited to receive him, and was attacked on the 12th and 13th without ſucceſs: but on the 14th, the attack of the Pruſſians was irreſiſtible, and Dumourier retreating, gave up the paſs. On his march he was ſo violently preſſed by the advanced cavalry of the Pruſſians, that his army, at one time, was ſeized with a panic, and fled before 1500 men; who, if they had puſhed their advantage, might have diſperſed it. On the 15th, however, Dumourier encamped at St Menehould, and began to fortify it. Bournonville's army joined Dumourier on the 17th. The duke of Brunſwick formed a plan of attacking Kellerman before his junction could be completed. That general arrived on the 19th within a mile of Dumourier's camp; the projected attack took place; the Pruſſians manœuvred with their uſual coolneſs and addreſs; they attempted to ſurround Kellerman's army, but this could not be accompliſhed. The French troops preſerved excellent order, while the national vivacity was conſtantly ſhowing itſelf in their ſhouts and patriotic ſongs: 400 French were killed, and 500 wounded; the loſs of the Pruſſians was much greater: and, in the face of the enemy, Kellerman joined Dumourier at the end of the engagement without oppoſition. At the time that the attack was made on the army of Kellerman, an attempt was made to force Dillon's camp at Bieſme by the 20,000 men that had been left in its vicinity, but without ſucceſs; and this large detachment was thus prevented from croſſing the foreſt of Argonne and joining the duke of Brunſwick. It is to be obſerved, that in theſe engagements the French owed their ſuperiority chiefly to the excellence of their artillery; a circumſtance which ſerved to convince their enemies that they had

329 The Pruſſians oblige him to retreat, but do not follow up their advantage.

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had to contend with regular military bodies, and not with undiſciplined multitudes, as they expected.

332 The Pruſſians diſtreſſed by ſickneſs and famine.

The duke of Brunſwick encamped his army at La Lun, near the camp of Dumourier. And here the Pruſſians began to be in extreme diſtreſs both from ſickneſs and famine. No temptation could induce the inhabitants of the country to carry proviſions to the hoſtile camp, while at the ſame time the French army was abundantly ſupplied.

Bournonville, with a body of 4000 men, intercepted ſeveral droves of cattle and other convoys of proviſions deſtined for the Pruſſians. The rain fell in torrents, and the roads were uncommonly deep. Expoſed to the cold, the moiſture, and want of proviſions, the Pruſſians raſhly ate great quantities of the grapes of Champagne. The conſequence of this was, that an epidemical diſtemper commenced and ſpread through the army to ſuch an extent, that 10,000 men at one time were unfit for duty. The duke of Brunſwick, however, ſtill commanded a force much more numerous than that of Dumourier; and he has been much cenſured for not attacking his camp, and forcing him to engage. It has been ſaid that the veteran and numerous force which he commanded would have marched to certain victory againſt the raw troops that oppoſed them; that, having defeated Dumourier's army, there was nothing to oppoſe their march to Paris. But the duke of Brunſwick had entered France upon the ſuppoſition, that in its preſent diſtracted ſtate no regular army could be brought into the field againſt him, and that the people at large were hoſtile to the ruling faction. The contrary of all this had turned out to be true. He found himſelf in the midſt of an hoſtile people, and oppoſed by ſkilful military chiefs. A defeat in ſuch a ſituation would have brought certain ruin to his army; and even the loſs ſuſtained in the acquiſition of a victory might have proved equally fatal. The remains of the French army would not fail to hang upon his rear; and from the diſpoſition of the people it appeared impoſſible to aſcertain to what amount that army might be ſuddenly increaſed. After propoſing a truce, therefore, which laſted eight days, he commenced his retreat towards Grandpré, and no advantage was gained over him in the courſe of it. Verdun was retaken by the French on the 12th of October, and Longwy on the 18th; the ſiege of Thionville was at the ſame time raiſed. That ſmall, but ſtrong fortreſs, under the command of General Felix Wimpfen, had held in check an army of 15,000 men.

333 Liſle ſummoned and vigorouſly beſieged by the Auſtrians, but in vain.

While the Pruſſians were advancing from the north-eaſt, the Auſtrians under the duke of Saxe Teſchen laid ſiege to Liſle. The council-general of the commune anſwered the ſummons of the beſiegers thus: "We have juſt renewed our oath to be faithful to the nation, and to maintain liberty and equality, or to die at our poſt. We will not perjure ourſelves." Such was the cant of theſe men, who had already perjured themſelves by contributing to overturn the conſtitution which they had repeatedly ſworn to defend. The Auſtrian batteries began to play upon the town on the 29th, and were chiefly directed againſt that quarter which was inhabited by the lower claſs of citizens, for the purpoſe of making them mutinous and ſeditious. This procedure was ill judged. The lower claſſes of mankind are always much accuſtomed to hardſhips, and they go fartheſt in ſupport of any enthuſiaſtic principle they have been perſuaded to adopt. Accordingly, though a great part of the city was reduced to a heap of ruins, the citizens of Liſle became daily more obſtinate. They received each other into the houſes that were ſtill ſtanding, and every vault and cellar was occupied. Although upwards of 30,000 red-hot balls and 6000 bombs were thrown into the city, beſides the efforts made by an immenſe battering train of artillery, yet the loſs both to the garriſon and people did not exceed 500 perſons, moſt of whom were women and children. After a fortnight of fruitleſs labour, the Auſtrians raiſed the ſiege.

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334 War declared againſt the king of Sardinia, Savoy taken, &c.

War had been declared againſt the king of Sardinia on account of the threatening appearances exhibited in that quarter. On the 20th of September General Monteſquieu entered the territories of Savoy, and was received at Chambery and throughout the whole country with marks of unbounded welcome. On the 29th General Anſelm, with another body of troops, took poſſeſſion of Nice and the country around it. On the 30th General Cuſtine advanced to Spires, when he found the Auſtrians drawn up in order of battle. He attacked and drove them through the city, taking 3000 of them priſoners. The capture of Worms ſucceeded that of Spires; Mentz ſurrendered by capitulation; and Franckfort fell into the hands of the French on the 23d. Out of this laſt place, however, they were afterwards driven on the 2d of December.

335 The national convention aſſembled,

On the 20th of September the French *National Convention* aſſembled. It was found to contain men of all characters, orders, and ranks. Many diſtinguiſhed members of the *Conſtituting* Aſſembly were elected into it, and alſo ſeveral that had belonged to the *Legiſlative* Aſſembly; even foreigners were invited to become French legiſlators. The famous Thomas Paine and Dr Prieſtley of England were elected by certain departments; but the latter declined accepting. Clouts, a Pruſſian, whom we formerly noticed as bringing a deputation to the bar of the conſtituent aſſembly, conſiſting of perſons repreſenting all the nations of the earth, was alſo choſen. The general aſpect of the new convention ſhowed that the republican party had acquired a decided ſuperiority. On the firſt day of meeting M. Collot d'Herbois, who had formerly been an actor, aſcended the tribune, and propoſed *the eternal abolition of royalty in France.* The queſtion was carried by acclamation, and the houſe adjourned. Meſſages were ſent to all parts of the country to intimate the decree, and by the influence of the Jacobins they were everywhere received with applauſe. It was next day decreed, that all public acts ſhould be dated by the year of the French republic; and all citizens were declared eligible to all the vacant offices and places. The rage of republicaniſm ſoon went ſo far, that the ordinary titles of Monſieur and Madame were aboliſhed, and the appellation of *Citizen* ſubſtituted in their ſtead, as more ſuitable to the principles of liberty and equality.—It may be remarked, that in this laſt trifling circumſtance an attachment to the form of ſpeech to which they had been accuſtomed appears even in its abolition: For, although the Roman orators addreſſed their countrymen when aſſembled by the honourable appellation of *Citizens*, yet they never, in accoſting an individual, called him Citizen Cato, or Citizen Cæſar, according to the mode now adopted in France.

336 and decrees the eternal abolition of royalty in France.

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It was ſoon diſcovered that the leading republicans had divided into two oppoſite factions. The one of theſe was called *Girondiſts*, becauſe Vergniaud, Genſonné, Guadet, and ſome others of its leaders, were members from the department of La Gironde. The celebrated Condorcet belonged to this party; and they were ſometimes denominated *Briſſotines*, from M. Briſſot de Warville their principal leader. They ſupported the miniſtry now in office, at the head of which was Roland; and the majority of the convention was obviouſly attached to them. In oppoſition to theſe was the ſmaller party of the *Mountain*: ſo called from its members uſually ſitting in the convention on the upper ſeats of the hall. They were men poſſeſſed of leſs perſonal reſpectability, and fewer literary accompliſhments, but of daring and ſanguinary characters, whom the revolution had brought into public notice. At the head of this party were Danton and Robeſpierre; and ſubordinate to theſe were Couthon, Bazire, Thuriot, Merlin de Thionville, St André, Camille Demoulins, Chabot, Collot D'Herbois, Sergent, Legendre, Fabre d'Eglantine, Panis, and Marat.

337 Two oppoſite factions in the convention.

Theſe two parties ſhowed the diverſity of their characters in the manner in which they treated the maſſacres of the 2d and 3d of September. The Briſſotines, with the majority of the convention, wiſhed to bring the murderers to trial; but the queſtion was always eluded by the other party, with the aſſiſtance of the Jacobin club and of the populace.

338 Decree againſt the emigrants, &c.

On the 9th of October it was decreed, that all emigrants, when taken, ſhould ſuffer death; and on the 15th of November, in conſequence of an inſurrection in the duchy of Deux Ponts, and an application on the part of the inſurgents to the convention for aid, the following decree was paſſed: "The national convention declare, in the name of the French nation, that they will grant fraternity and aſſiſtance to all thoſe people who wiſh to procure liberty; and they charge the executive power to ſend orders to the generals to give aſſiſtance to ſuch people as have ſuffered, or are now ſuffering, in the cauſe of liberty." Of this decree foreign nations, with great reaſon, complained much, as will ſhortly appear.

339 Battle of Jemappe, and ſurrender of the Auſtrian Netherlands.

To return to the military affairs of the new republic. On the 12th of October General Dumourier came to Paris, and was ſpeedily ſent to commence a winter campaign in the Netherlands. He ſuddenly attacked the Auſtrians at the village of Boſſu, and drove them from their ground. On the 5th of November he came in ſight of the enemy upon the heights of *Jemappe*. Three rows of fortifications aroſe above each other, defended by 100 pieces of cannon. Their right was covered by the village and a river, and their left by thick woods. The French were by their own account 30,000, whilſt others, with great probability of truth, compute them at double that number, and the number of the Auſtrians was at leaſt 20,000. At ſeven in the morning of the following day a heavy cannonade commenced on both ſides, and at noon a cloſe attack was determined on by the French, whoſe right wing was commanded by Generals Bournonville and Dampierre, and the centre by Generals Egalité (ſon to the duke of Orleans who had aſſumed that name), Stetenboffe, Deſporets, and Drouet. The muſic played the popular march of the Marſellois, and the ſoldiers ruſhed on with enthuſiaſm, ſhouting "Vive la nation." The engagement was warm and bloody; the French were twice repulſed; but their impetuoſity was at laſt irreſiſtible, and about two o'clock the enemy fled from their laſt entrenchments. The loſs on both ſides was very great, that of the Auſtrians amounting to 4000. This victory was deciſive of the fate of the Netherlands. Mons and Bruſſels ſurrendered to Dumourier; Tournay, Malines, Ghent, and Antwerp, were taken poſſeſſion of by General Labourdonnaye; Louvaine and Namur were taken by General Valence; and the whole Auſtrian Netherlands, Luxembourg only excepted, fell into the hands of the French: Liege was taken on the 28th of November after a ſucceſsful engagement, in which the Auſtrians loſt 5 or 600 men and an immenſe train of artillery.

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340 Violent conteſts between the Girondiſts and the Mountain.

France was now in a ſituation not unuſual in the hiſtory of thoſe nations that either are free, or are attempting to become ſo; ſucceſsful in all quarters abroad, but diſtracted by factions at home. The two parties in the convention were engaged in a ſtruggle, which daily became more implacable. The party called the *Mountain* did not heſitate about the nature of the means they were to employ to bring about the ruin of their antagoniſts. They are even ſuſpected of having, through the medium of Pache the war-miniſter, retarded the ſupply of the armies, to render the ruling party odious by want of ſucceſs. They were for ſome time, however, unfortunate in this reſpect; and the daily news of victories ſupported with the public the credit of the Girondiſts. A new ſubject was therefore fallen upon, which was the queſtion, how the dethroned king was to be diſpoſed of? The moderate party wiſhed to ſave him; and this was a ſufficient reaſon for their antagoniſts to reſolve upon his ruin. A committee was appointed to give in a report upon his conduct. A variety of accuſations were brought againſt him; and the convention infamouſly reſolved to act the part of accuſers and of judges.

341 The king brought to trial.

It was on the 11th of December when the ill-fated monarch was ordered to the bar of the convention: the act of accuſation was read, and the king was ſummoned by the preſident, Barrere, to anſwer to each ſeparate charge.

Pref. "Louis, the French nation accuſes you of having committed a multitude of crimes to eſtabliſh your tyranny, in deſtroying her freedom. You, on the 20th of June 1789, attempted the ſovereignty of the people, by ſuſpending the aſſemblies of their repreſentatives, and expelling them with violence from the places of their ſittings. This is proved in the proceſs verbal entered at the Tennis-court of Verſailles by the members of the conſtituent aſſembly. On the 23d of June you wanted to dictate laws to the nation; you ſurrounded their repreſentatives with troops; you preſented to them two royal declarations, ſubverſive of all liberty, and ordered them to ſeparate. Your own declarations, and the minutes of the aſſembly, prove theſe attempts. What have you to anſwer?"

Louis. "No laws were then exiſting to prevent me from it."

Pref. "You ordered an army to march againſt the citizens of Paris. Your ſatellites have ſhed the blood of ſeveral of them, and you would not remove this army till the taking of the Baſtile and a general inſurrection announced to you that the people were victorious The

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ſpeeches you made on the 9th, 12th, and 14th of July to the deputations of the conſtituent aſſembly, ſhew what were your intentions; and the maſſacres of the Thuilleries riſe in evidence againſt you.—What have you to anſwer?"

Louis. "I was maſter at that time to order the troops to march; but I never had an intention of ſhedding blood."

Pref. "After theſe events, and in ſpite of the promiſes which you made on the 15th in the conſtituent aſſembly, and on the 17th in the town-houſe of Paris, you have perſiſted in your projects againſt national liberty. You long eluded the execution of the decrees of the 11th of Auguſt, reſpecting the abolition of perſonal ſervitude, the feudal government, and tythes: you long refuſed acknowledging the rights of man: you doubled the number of the life-guards, and called the regiment of Flanders to Verſailles: you permitted, in orgies held before your eyes, the national cockade to be trampled under foot, the white cockade to be hoiſted, and the nation to be ſlandered. At laſt, you rendered neceſſary a freſh inſurrection, occaſioned the death of ſeveral citizens, and did not change your language till after your guards had been defeated, when you renewed your perfidious promiſes. The proofs of theſe facts are in your obſervations of the 18th of September, in the decrees of the 11th of Auguſt, in the minutes of the conſtituent aſſembly, in the events of Verſailles of the 5th and 6th of October, and in the converſation, you had on the ſame day with a deputation of the conſtituent aſſembly, when you told them you would enlighten yourſelf with their councils, and never recede from them.—What have you to anſwer?"

Louis. "I have made the obſervations which I thought juſt on the two firſt heads. As to the cockade, it is falſe; it did not happen in my preſence."

Pref. "You took an oath at the federation of the 14th of July, which you did not keep. You ſoon tried to corrupt the public opinion, with the aſſiſtance of Talon who acted in Paris, and Mirabeau who was to have excited counter-revolutionary movements in the provinces.—What have you to anſwer?"

Louis. "I do not know what happened at that time; but the whole is anterior to my acceptance of the conſtitution."

Pref. "You laviſhed millions of money to effect this corruption, and you would even uſe popularity as a means of enſlaving the people. Theſe facts are the reſult of a memorial of Talon, on which you have made your marginal comments in your own hand writing, and of a letter which Laporte wrote to you on the 19th of April; in which, recapitulating a converſation he had with Rivarol, he told you, that the millions which you had been prevailed upon to throw away had been productive of nothing. For a long time you had meditated on a plan of eſcape. A memorial was delivered to you on the 28th of February, which pointed out the means for you to effect it; you approve of it by marginal notes.—What have you to anſwer?"

Louis. "I felt no greater pleaſure than that of relieving the needy: this proves no deſign."

Pref. "On the 28th a great number of the nobles and military came into your apartments in the caſtle of the Thuilleries to favour that eſcape; you wanted to quit Paris on the 10th of April to go to St Cloud.—What have you to anſwer?"

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Louis. "This accuſation is abſurd."

Pref. "But the reſiſtance of the citizens made you ſenſible that their diſtruſt was great; you endeavoured to diſcard it by communicating to the conſtituent aſſembly a letter, which you addreſſed to the agents of the nation near foreign powers, to announce to them that you had freely accepted the conſtitutional articles, which had been preſented to you; and, notwithſtanding, on the 21ſt you took flight with a falſe paſſport. You left behind a proteſt againſt theſe ſelf-ſame conſtitutional articles; you ordered the miniſters to ſign none of the acts iſſued by the national aſſembly; and you forbade the miniſter of juſtice to deliver up the ſeals of ſtate. The public money was laviſhed to inſure the ſucceſs of this treachery, and the public force was to protect it, under the orders of Bouillé, who ſhortly before had been charged with the maſſacre of Nancy, and to whom you wrote on this head, "to take care of his popularity, becauſe it would be of ſervice to you." Theſe facts are proved by the memorial of the 23d of February, with marginal comments in your own hand-writing; by your declaration of the 20th of June, wholly in your own hand-writing; by your letter of the 4th of September 1790 to Bouillé; and by a note of the latter, in which he gives you an account of the uſe he made of 993,000 livres, given by you, and employed partly in trepanning the troops who were to eſcort you.—What have you to anſwer?"

Louis. "I have no knowledge whatever of the memorial of the 23d of February. As to what relates to my journey to Varennes, I appeal to my declaration to the commiſſaries of the conſtituent aſſembly at that period."

Pref. "After your detention at Varennes, the exerciſe of the executive power was for a moment ſuſpended in your hands, and you again formed a conſpiracy. On the 17th of July the blood of citizens was ſhed in the Champ de Mars. A letter, in your own hand-writing, written in 1790 to La Fayette, proves that a criminal coalition ſubſiſted between you and La Fayette, to which Mirabeau acceded. The reviſion began under theſe cruel auſpices; all kinds of corruptions were made uſe of. You have paid for libels, pamphlets, and newſpapers, deſigned to corrupt the public opinion, to diſcredit the aſſignats, and to ſupport the cauſe of the emigrants. The regiſters of Septeuil ſhew what immenſe ſums have been made uſe of in theſe liberticide manœuvres.—What have you to anſwer?

Louis. "What happened on the 17th of July has nothing at all to do with me. I know nothing of it."

Pref. "You ſeemed to accept the conſtitution on the 14th of September; your ſpeeches announced an intention of ſupporting it, and you were buſy in overturning it, even before it was completed. A convention was entered into at Pilnitz on the 24th of July, between Leopold of Auſtria and Frederic-William of Brandenburgh, who pledged themſelves to re-erect in France the throne of abſolute monarchy, and you were ſilent upon this convention till the moment when it was known by all Europe.—What have you to anſwer?"

Louis. "I made it known as ſoon as it came to my knowledge; beſides, every thing that refers to this ſubject concerns the miniſter."

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Pref. " Arles had hoiſted the ſtandard of rebellion; you favoured it by ſending three civil commiſſaries, who made it their buſineſs not to repreſs the counter-revolutioniſts, but to juſtify their proceedings.—What have you to anſwer?"

Louis. " The inſtructions which were given to the commiſſaries muſt prove what was their miſſion; and I knew none of them when the miniſters propoſed them to me."

Pref. " Avignon, and the county of Venaiſſin, had been united with France; you cauſed the decree to be executed; but a month after that time civil war deſolated that country. The commiſſaries you ſent thither helped to ravage it.—What have you to anſwer?"

Louis. " I do not remember what delay has been cauſed in the execution of the decree; beſides, this occurrence has no perſonal reference to me; it only concerns thoſe that have been ſent, not thoſe who ſent them."

Pref. " Nimes, Montauban, Mende, Jales, felt great ſhocks during the firſt days of freedom. You did nothing to ſtifle thoſe germens of counter-revolution till the moment when Saillant's conſpiracy became manifeſtly notorious.—What have you to anſwer?"

Louis. " I gave, in this reſpect, all the orders which were propoſed to me by the miniſters."

Pref. " You ſent 22 battalions againſt the Marſeillois, who marched to reduce the counter-revolutioniſts of Arles.—What have you to anſwer?"

Louis. " I ought to have the pieces referring to this matter, to give a juſt anſwer."

Pref. " You gave the ſouthern command to Witgenſtein, who wrote to you on the 21ſt of April 1792, after he had been recalled: ' A few inſtants more, and I ſhall call around the throne of your majeſty thouſands of French, who are again become worthy of the wiſhes you form for their happineſs.'—What have you to anſwer?"

Louis. " This letter is dated ſince his recall; he has not been employed ſince. I do not recollect this letter?"

Pref. " You paid your late life-guards at Coblentz; the regiſters of Septeuil atteſt this; and general orders ſigned by you prove that you ſent conſiderable remittances to Bouillé, Rochefort, Vauguyon, Choiſeul, Beaupre, Hamilton, and the wife of Polignac.—What have you to anſwer?"

Louis. " When I firſt learned that my life-guards aſſembled beyond the Rhine, I ſtopped their pay: as to the reſt, I do not remember."

Pref. " Your brothers, enemies to the ſtate, cauſed the emigrants to rally under their banners: they raiſed regiments, took up loans, and concluded alliances in your name: you did not diſclaim them; but at the moment when you were fully certain that you could no longer croſs their projects, your intelligence with them by a note, written by Louis Staniſlaus Xavier, ſigned by your two brothers, was conceived in theſe words:

' I wrote to you, but it was by poſt, and I could ſay nothing. We are two here, who make but one; one in ſentiments, one in principles, one in zeal of ſerving you. We keep ſilence; becauſe, were we to break it too ſoon, it would injure you: but we ſhall ſpeak as ſoon as we ſhall be certain of general ſupport, and that moment is near. If we are ſpoken to on the part of thoſe people, we ſhall hear nothing; but if on your part, we will liſten: we ſhall purſue our road ſtraight. It is therefore deſired that you will enable us to ſay ſomething. Do not ſtand on ceremonies. Be eaſy about your ſafety: we only exiſt to ſerve you; we are eagerly occupied with this point, and all goes on well; even our enemies feel themſelves too much intereſted in your preſervation to commit an uſeleſs crime which would terminate in their own deſtruction.

' L. S. Xavier and
' Charles Philippe.'

" What have you to anſwer?"

Louis. " I diſowned all the proceedings of my brothers, according as the conſtitution preſcribed me to do, and from the moment they came to my knowledge. Of this note I know nothing."

Pref. " The ſoldiers of the line, who were to be put on the war eſtabliſhment, conſiſted but of 100,000 men at the end of December, you therefore neglected to provide for the ſafety of the ſtate from abroad. Narbonne required a levy of 50,000 men, but he ſtopped the recruiting at 26,000, in giving aſſurances that all was ready; yet there was no truth in theſe aſſurances. Servan propoſed after him to form a camp of 20,000 men near Paris; it was decreed by the legiſlative aſſembly; you refuſed your ſanction.—What have you to anſwer?"

Louis. " I had given to the miniſters all the orders for expediting the augmentation of the army: in the month of December laſt, the returns were laid before the aſſembly. If they deceived themſelves, it is not my fault."

Pref. " A flight of patriotiſm made the citizens repair to Paris from all quarters. You iſſued a proclamation, tending to ſtop their march; at the ſame time our camps were without ſoldiers. Dumourier, the ſucceſſor of Servan, declared that the nation had neither arms, ammunition, nor proviſions, and that the poſts were left defenceleſs. You waited to be urged by a requeſt made to the miniſter Lajard, when the legiſlative aſſembly wiſhed to point out the means of providing for the external ſafety of the ſtate, by propoſing the levy of 42 battalions. You gave commiſſion to the commanders of the troops to diſband the army, to force whole regiments to deſert, and to make them paſs the Rhine, to put them at the diſpoſal of your brothers, and of Leopold of Auſtria, with whom you had intelligence. This fact is proved by the letter of Toulougeon, governor of Franche Comté.—What have you to anſwer?"

Louis. " I know nothing of this circumſtance; there is not a word of truth in this charge."

Pref. " You charged your diplomatic agents to favour this coalition of foreign powers and your brothers againſt France, and eſpecially to cement the peace between Turkey and Auſtria, and to procure thereby a larger number of troops againſt France from the latter. A letter of Choiſeul-Gouffier, ambaſſador at Conſtantinople, verifies the fact.—What have you to anſwer?"

Louis. " M. Choiſeul did not ſpeak the truth: no ſuch thing has ever been.

Pref. " The Pruſſians advanced againſt our frontiers: your miniſter was ſummoned on the 8th of July to give an account of the ſtate of our political relations with

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with Prussia; you answered, on the 10th, that 50,000 Prussians were marching against us, and that you gave notice to the legislative body of the formal acts of the pending hostilities, in conformity to the constitution.—What have you to answer?"

Louis. "It was only at that period I had knowledge of it: all the correspondence passed with the ministers."

Pref. "You entrusted Dabancourt, the nephew of Calonne, with the department of war; and such has been the success of your conspiracy, that the posts of Longwy and Verdun were surrendered to the enemy at the moment of their appearance.—What have you to answer?"

Louis. "I did not know that Dabancourt was M. Calonne's nephew. I have not divested the posts. I would not have permitted myself such a thing. I know nothing of it, if it has been so."

Pref. "You have destroyed our navy—a vast number of officers belonging to that corps had emigrated; there scarcely remained any to do duty in the harbours; meanwhile Bertrand was granting passports every day; and when the legislative body represented to you his criminal conduct on the 8th of March, you answered, that you were satisfied with his services.—What have you to answer?"

Louis. "I have done all I could to retain the officers. As to M. Bertrand, since the legislative assembly presented no complaint against him that might have put him in a state of accusation, I did not think proper to turn him out of office.

Pref. "You have favoured the maintenance of absolute government in the colonies; your agents fomented troubles and counter-revolutions throughout them, which took place at the same epoch when it was to have been brought about in France, which indicates plainly that your hand laid this plot.—What have you to answer?"

Louis. "If there are any of my agents in the colonies, they have not spoken the truth; I had nothing to do with what you have just mentioned."

Pref. "The interior of the state was convulsed by fanatics; you avowed yourself their protector, in manifesting your evident intention of recovering by them your ancient power.—What have you to answer?"

Louis. "I cannot answer to this; I know nothing of such a project."

Pref. "The legislative body had passed a decree on the 29th of January against the factious priests; you suspended its execution.—What have you to answer?"

Louis. "The constitution reserved to me the free right to refuse my sanction of the decrees."

Pref. "The troubles had increased; the minister declared, that he knew no means in the laws extant to arraign the guilty. The legislative body enacted a fresh decree, which you likewise suspended. What have you to say to this?"

[Louis replied in the same manner as in the preceding charge.]

Pref. "The uncitizen-like conduct of the guards whom the constitution had granted you, had rendered it necessary to disband them. The day after, you sent them a letter expressive of your satisfaction, and continued their pay. This fact is proved by the treasurer of the civil list.—What have you to answer?"

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Louis. "I only continued them in pay till fresh ones could be raised, according to the tenor of the decree."

Pref. "You kept near your person the Swiss guards: the constitution forbade you this, and the legislative assembly had expressly ordained their departure.—What have you to answer?"

Louis. "I have executed all the decrees that have been enacted in this respect.

Pref. "You had private companies at Paris, charged to operate movements useful to your projects of a counter-revolution. Dangremont and Gilles were two of your agents, who had salaries from the civil list. The receipts of Gilles, who was ordered to raise a company of 60 men, shall be presented to you.—What have you to answer?"

Louis. "I have no knowledge whatever of the projects laid to their charge: the idea of a counter-revolution never entered into my mind."

Pref. "You wished to suborn, with considerable sums, several members of the legislative and constituent assemblies. Letters from St Leon and others evince the reality of these deeds.—What have you to answer?"

Louis. "Several persons presented themselves with similar decrees, but I have waved them."

Pref. "Who are they that presented you with those projects?"

Louis. "The plans were so vague that I do not recollect them now."

Pref. "Who are those to whom you gave money."

Louis. "I gave money to nobody."

Pref. "You suffered the French name to be reviled in Germany, Italy, and Spain, since you omitted to demand satisfaction for the bad treatment which the French suffered in those countries.—What have you to answer?"

Louis. "The diplomatical correspondence will prove the contrary; besides, this was a concern of the ministers."

Pref. "You reviewed the Swiss on the 10th of August at five o'clock in the morning; and the Swiss were the first who fired upon the citizens."

Louis. "I went on that day to review all the troops that were assembled about me; the constituted authorities were with me, the department, the mayor, the municipality; I had even invited thither a deputation of the National Assembly, and I afterwards repaired into the midst of them with my family."

Pref. "Why did you draw troops to the castle?"

Louis "All the constituted authorities saw that the castle was threatened; and as I was a constituted authority, I had a right to defend myself."

Pref "Why did you summon the mayor of Paris in the night between the 9th and 10th of August to the castle?"

Louis. "On account of the reports that were circulated."

Pref. "You have caused the blood of the French to be shed."

Louis. "No, Sir, not I."

Pref. "You authorized Septeuil to carry on a considerable

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conſiderable trade in corn, ſugar, and coffee, at Hamburg. This fact is proved by a letter of Septeuil."

Louis. "I know nothing of what you ſay."

Preſ. "Why did you affix a *veto* on the decree which ordained the formation of a camp of 20,000 men?"

Louis. "The conſtitution left to me the free right of refuſing my ſanction of the decrees; and even from that period I had demanded the aſſemblage of a camp at Soiſſons."

Preſident, addreſſing the convention. "The queſtions are done with." (To Louis)—"Louis, is there any thing that you wiſh to add?"

Louis. "I requeſt a communication of the charges which I have heard, and of the pieces relating thereto, and the liberty of chooſing counſel for my defence.

Valazé, who ſat near the bar, preſented and read to Louis Capet the pieces, viz. The memoir of Laporte and Mirabeau, and ſome others, containing plans of a counter-revolution.

Louis. "I diſown them."

Valazé next preſented ſeveral other papers, on which the act of accuſation was founded, and aſked the king if he recognized them. Theſe papers were the following:

Valazé. "Letter of Louis Capet, dated June 29th 1790, ſettling his connexions with Mirabeau and La Fayette to effect a revolution in the conſtitution."

Louis. "I reſerve to myſelf to anſwer the contents"—(Valazé read the letter.)—"It is only a plan, in which there is no queſtion about a counter-revolution; the letter was not to have been ſent."

Valazé. "Letter of Louis Capet, of the 22d of April, relative to converſations about the Jacobins, about the preſident of the committee of finances, and the committee of domains; it is dated by the hand of Louis Capet."

Louis. "I diſown it."

Valazé. "Letter of Laporte, of Thurſday morning, March 3d, marked in the margin in the hand-writing of Louis Capet with March 3d 1791, implying a pretended rupture between Mirabeau and the Jacobins."

Louis. "I diſown it."

Valazé. "Letter of Laporte without date, in his hand-writing, but marked in the margin by the hand of Louis Capet, containing particulars reſpecting the laſt moments of Mirabeau, and expreſſing the care that had been taken to conceal from the knowledge of men ſome papers of great concern which had been depoſited with Mirabeau."

Louis. "I diſown it as well as the reſt."

Valazé. "Plan of a conſtitution, or reviſion of the conſtitution, ſigned la Fayette, addreſſed to Louis Capet, April 6th 1790, marked in the margin with a line in his own hand-writing."

Louis. "Theſe things have been blotted out by the conſtitution."

Valazé. "Do you know this writing?"

Louis. "I do not."

Valazé. Your marginal comments?"

Louis. "I do not."

Valazé. "Letter of Laporte of the 19th of April, marked in the margin by Louis Capet April 19. 1791, mentioning a converſation with Rivarol."

Louis. "I diſown it."

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Valazé. "Letter of Laporte, marked April 16. 1791, in which it ſeems complaints are made of Mirabeau, the abbé Perigord, André, and Beaumetz, who do not ſeem to acknowledge ſacrifices made for their ſake."

Louis. "I diſown it likewiſe."

Valazé. "Letter of Laporte of the 23d of February 1791, marked and dated in the hand-writing of Louis Capet; a memorial annexed to it, reſpecting the means of his gaining popularity."

Louis. "I know neither of theſe pieces."

Valazé. "Several pieces without ſignature, found in the caſtle of the Thuilleries, in the gap which was ſhut in the walls of the palace, relating to the expences to gain that popularity."

Preſident. "Previous to an examination on this ſubject, I wiſh to aſk a preliminary queſtion: Have you cauſed a preſs with an iron door to be conſtructed in the caſtle of the Thuilleries, and had you your papers locked up in that preſs?"

Louis. "I have no knowledge of it whatever."

Valazé. Here is a day-book written by Louis Capet himſelf, containing the penſions he has granted out of his coffer from 1776 till 1792, in which are obſerved ſome douceurs granted to Acloque."

Louis. "This I own, but it conſiſts of charitable donations which I have made."

Valazé. "Different liſts of ſums paid to the Scotch companies of Noailles, Gramont, Montmorency, and Luxembourg, on the 9th of July 1791."

Louis. "This is prior to the epoch when I forbade them to be paid."

Preſ. "Louis, where had you depoſited thoſe pieces which you own?"

Louis. "With my treaſurer."

Valazé. "Do you know theſe penſion-liſts of the life-guards, the one hundred Swiſs, and the king's guards for 1792?"

Louis. "I do not."

Valazé. "Several pieces relative to the conſpiracy of the camp of Jales, the original of which are depoſited among the records of the department of L'Ardêche."

Louis. "I have not the ſmalleſt knowledge of them."

Valazé. "Letter of Bouillé, dated Mentz, bearing an account of 993,000 livres received of Louis Capet."

Louis. "I diſown it."

Valazé. "An order for payment of 168,000 livres, ſigned Louis, indorſed Le Bonneirs, with a letter and billet of the ſame."

Louis. "I diſown it."

Valazé. "Two pieces relative to a preſent made to the wife of Polignac, and to Lavauguyon and Choiſeul."

Louis. "I diſown them as well as the others."

Valazé. "Here is a note ſigned by the two brothers of the late king, mentioned in the declaratory act."

Louis. "I know nothing of it."

Valazé. "Here are pieces relating to the affair of Choiſeul-Gouffier at Conſtantinople."

Louis. "I have no knowledge of them."

Valazé.

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Valazé. "Here is a letter of the late king to the biſhop of Clermont, with the anſwer of the latter, of the 16th of April 1791."

Louis. "I diſown it."

Preſident. "Do you not acknowledge your writing and your ſignet?"

Louis. "I do not."

Preſident. "The ſeal bears the arms of France."

Louis. "Several perſons made uſe of that ſeal."

Valazé. "Do you acknowledge this liſt of ſums paid to Gilles?"

Louis. "I do not."

Valazé. "Here is a memorandum for indemnifying the civil liſt for the military penſions; a letter of Dufreſne St Leon, which relates to it."

Louis. "I know none of thoſe pieces."

342 He is allowed to nominate his own counſel;

When the whole had been inveſtigated in this manner, the preſident, addreſſing the king, ſaid, "I have no other queſtions to propoſe—have you any thing more to add in your defence?"—"I deſire to have a copy of the accuſation (replied the king), and of the papers on which it is founded. I alſo deſire to have a counſel of my own nomination." Barrere informed him, that his two firſt requeſts were already decreed, and that the determination reſpecting the other would be made known to him in due time.

It would have been an exceſs of cruelty to refuſe a requeſt ſo reaſonable in itſelf; it was therefore decreed that counſel ſhould be allowed to the king, and his choice fell upon M. M. Tronchet, Lamoignon, Maleſherbes, and Deſeze; he had previouſly applied to M. Target, who excuſed himſelf on account of his age and infirmity. On the 26th of December, the king appeared for the laſt time at the bar of the convention; and M. Deſeze read a defence which the counſel had prepared, and which was equally admired for the ſolidity of the argument and the beauty of the compoſition.

When the defence was finiſhed, the king aroſe, and holding a paper in his hand, pronounced in a calm manner, and with a firm voice, what follows: "Citizens, you have heard my defence; I now ſpeak to you, perhaps for the laſt time, and declare that my counſel have aſſerted nothing to you but the truth; my conſcience reproaches me with nothing. I never was afraid of having my conduct inveſtigated; but I obſerved with great uneaſineſs, that I was accuſed of giving orders for ſhedding the blood of the people on the 10th of Auguſt. The proofs I have given through my whole life of a contrary diſpoſition, I hoped would have ſaved me from ſuch an imputation, which I now ſolemnly declare is entirely groundleſs."

343 but is condemned to death by a ſmall majority.

The diſcuſſion was fatally cloſed on the 16th of January. After a ſitting of near 34 hours, the puniſhment of death was awarded by a ſmall majority of the convention, and ſeveral of theſe differed in opinion from the reſt, reſpecting the time when it ſhould be inflicted; ſome contending that it ſhould not be put in execution till after the end of the war, while others propoſed to take the ſenſe of the people, by referring the ſentence to the primary aſſemblies.

M. Deſeze then ſolemnly invoked the aſſembly in the name of his colleagues, to conſider by what a ſmall majority the puniſhment of death was pronounced againſt the dethroned monarch. "Do not afflict France (added this eloquent advocate) by a judgment that will appear terrible to her, when *five* voices only were preſumed ſufficient to carry it." He appealed to eternal juſtice, and ſacred humanity, to induce the convention to refer their ſentence to the tribunal of the people. "You have either forgotten or deſtroyed (ſaid the celebrated M. Tronchet) the lenity which the law allows to criminals, of requiring at leaſt *two-thirds* of the voices to conſtitute a definitive judgment."

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The ſentence was ordered to be executed in twenty-four hours.

344 And executed.

The king and his family had been for ſome time kept ſeparate from each other; but he was now allowed to ſee them, and to chooſe an eccleſiaſtic to attend him. The meeting, and, above all, the ſeparation from his family, was tender in the extreme. On Monday the 21ſt January, at eight o'clock in the morning, the unfortunate monarch was ſummoned to his fate. He aſcended the ſcaffold with a firm air and ſtep. Raiſing his voice, he ſaid, "Frenchmen, I die innocent; I pardon all my enemies; and may France"—at this inſtant the inhuman Santerre ordered the drums to beat, and the executioners to perform their office. When they offered to bind his hands, he ſtarted back as if about to reſiſt; but recollected himſelf in a moment, and ſubmitted. When the inſtrument of death deſcended, the prieſt exclaimed, "Son of St Louis, aſcend to heaven." The bleeding head was held up, and a few of the populace ſhouted *Vive la Republique.* His body was interred in a grave that was filled up with quicklime, and a guard placed around till it ſhould be conſumed.

345 Character of this unfortunate monarch.

Thus fell Louis XVI. He poſſeſſed from nature a good underſtanding, which, however, was blunted by the early indulgences of a court. He had a ſtrong ſenſe of juſtice, and his humanity was perhaps extreme. One defect rendered his virtues of little value, which was the poſſeſſion of an irreſolute and unſteady character. Unambitious, and eaſily adviſed, he was without difficulty induced to change his purpoſes, eſpecially by his queen, whoſe connexion with the houſe of Auſtria had always tended to render his counſels unpopular. Whether he was or was not connected with the foreign invaders of his country, poſterity muſt decide; but all men of ſenſe and moderation muſt be convinced that he was murdered by a band of ruffians. Indeed a ſentence ſo infamous, and in all reſpects unjuſt, is not to be found in the records of hiſtory. The greater part of the charges brought againſt him were trifling. Thoſe which ſeem to be of importance relate to conduct authorized by the conſtitution under which he acted; and that conſtitution declared his perſon inviolable. The ſevereſt puniſhment that he could incur by law, was not death, but depoſition; and there is no doubt, that in putting him to death the French nation broke the ſocial compact which their repreſentatives made with him. In a political view, this tragical event was injurious to the republican cauſe throughout Europe. No man out of France ventured to juſtify it; and in all countries it excited the moſt violent indignation againſt the rulers of the new republic.

346 Rupture with Great Britain.

New enemies were now haſtening to join the general league againſt France. We do not mean here to enter into a detail of the political ſtruggles that occurred in any other country, than that in the narrative of whoſe revolution we are now engaged. It will therefore only be neceſſary to remark in general, that the Britiſh government at this time thought itſelf endangered by the propagation of thoſe ſpeculative opinions which had

overturned

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overturned the French monarchy. Almoſt all the men of property in the kingdom concurred with the miniſtry in thinking a war with France neceſſary for the purpoſe of ſecuring the conſtitution at home. After the 10th of Auguſt the Britiſh miniſter had been recalled; but the new republic ſtill ſuffered the former ambaſſador from France, M. Chauvelin, to remain in England.

347 Grounds of the quarrel on the part of Great Britain.

The oſtenſible grounds of quarrel on the part of Great Britain were chiefly two; the decree of the 15th of November 1792, by which it was truly obſerved that encouragement to rebellion was held out to the ſubjects of every ſtate, and that war was thereby waged againſt every eſtabliſhed government. Of this decree the French executive council gave explanations, denying the fairneſs of the interpretation put upon it, and alleging, that the intention of the convention was only to give aid to ſuch countries as *had already* acquired their freedom, and by a declaration of the general will requeſted aid for its preſervation. But this explanation cannot be admitted. The decree expreſsly ſays, that the French nation will *grant aſſiſtance to all who wiſh to procure liberty;* and when it is conſidered what their notions of liberty are, it cannot be doubted but that their intention was to excite rebellion in foreign nations. The ſecond point of diſpute referred to the opening of the Scheldt. This river runs from Brabant through the Dutch territory to the ſea. The Dutch had ſhut up the mouth of it, and prevented any maritime commerce from being carried on by the people of Brabant by means of the river. To render themſelves popular in Brabant, the French had declared that they would open the navigation of the Scheldt. But Great Britain had ſome time before bound herſelf by treaty with the Dutch to aſſiſt them in obſtructing this navigation, and now declared to the French, that the project of opening the Scheldt muſt be renounced if peace with Great Britain was to remain. The French alleged, that by the law of nations navigable rivers ought to be open to all who reſide on their banks; but that the point was of no importance either to France or England, and even of very little importance to Holland; that if the people of Brabant themſelves choſe to give it up, they would make no objection. It has been thought remarkable, that the Dutch gave themſelves no trouble about the matter. They did not aſk the aſſiſtance of England; and with that coolneſs which is peculiar to their character, the merchants individually declared, that if the Scheldt was opened, they could manage their commerce as well at Antwerp as at Amſterdam. But in all this there is nothing ſtrange. Among the Dutch were many republicans, who wiſhed for the downfal of the ſtadtholder. Theſe rejoiced at every thing which diſtreſſed him, or had a tendency to render his office uſeleſs in the eyes of the people. Others, who thought differently, were afraid to ſpeak their ſentiments, as Dumourier was in their neighbourhood with a victorious army. The reſult of the whole was, that M. Chauvelin was commanded by the Britiſh government to leave this country. The French executive council gave powers to another miniſter, M. Maret, to negociate, and requeſted a paſſport for him; but he was not ſuffered to land. The haughty republicans having thus far humbled themſelves before the Britiſh government, at laſt, on the 1ſt of February 1793, on the motion of Briſſot, the national convention decreed, among other articles, that "George king of England had never ceaſed ſince the revolution of the 10th of Auguſt 1792 from giving to the French nation proofs of his attachment to the concert of crowned heads; that he had drawn into the ſame lake the ſtadtholder of the United Provinces; that, contrary to the treaty of 1783, the Engliſh miniſtry had granted protection to the emigrants and others who have openly appeared in arms againſt France; that they have committed an outrage againſt the French republic, by ordering the ambaſſador of France to quit Great Britain; that the Engliſh have ſtopped divers boats and veſſels laden with corn for France, whilſt, at the ſame time, contrary to the treaty of 1786, they continue the exportation of it to other foreign countries; that to thwart more efficaciouſly the commercial tranſactions of the republic with England, they have by an act of parliament prohibited the circulation of aſſignats. The convention therefore *declare*, that in conſequence of theſe acts of hoſtility and aggreſſion, the French republic is at war with the king of England and the ſtadtholder of the United Provinces.

348 War declared againſt the king of England and ſtadtholder of Holland.

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The abſurdity of pretending that any treaty with France made in 1783 could be violated by protecting the emigrants who fled from the fury of the convention, muſt be obvious to every reader. The convention was itſelf a rebellious uſurpation of the government with which ſuch a treaty was made. The prohibition of aſſignats was certainly contrary to no law, and was ſanctioned by every motive of expediency, unleſs the convention could prove that all nations were bound by the law of nature to riſk their own credit upon the credit of the French republic.

349 And againſt Spain.

About a fortnight after this abſurd declaration againſt Britain, war was likewiſe declared againſt Spain; and in the courſe of the ſummer France was at war with all Europe, excepting only Swiſſerland, Sweden, Denmark, and Turkey.

350 Proceeds of Dumourier.

In the mean time General Dumourier, who was proceeding agreeable to his orders, made an attack upon Holland; but in doing this he diſperſed his troops in ſuch a manner as to expoſe them much to any attack on the ſide of Germany. He commanded General Miranda to inveſt Maeſtricht, while he advanced to block up Breda, and Bergen-op-zoom. The firſt of theſe places, viz. Breda, ſurrendered on the 24th of February; Klundert was taken on the 26th; and Gertruydenberg on the 4th of March. But here the triumphs of Dumourier ended. The ſieges of Williamſtadt and Bergen-op-zoom were vigorouſly but unſucceſsfully preſſed. On the 1ſt of March General Clairfait having paſſed the Roer, attacked the French poſts, und compelled them to retreat with the loſs of 2000 men.

351 He is defeated.

The following day the archduke attacked them anew with conſiderable ſucceſs. On the 3d the French were driven from Aix-la-Chapelle, with the loſs of 4000 men killed and 1600 taken priſoners.

The ſiege of Maeſtricht was now raiſed, and the French retreated to Tongres, where they were alſo attacked, and forced to retreat to St Tron. Dumourier here joined them, but did not bring his army along with him from the attack upon Holland. After ſome ſkirmiſhes, a general engagement took place at Neerwinden. It was fought on the part of the French with great obſtinacy; but they were at length overpowered by the number of their enemies, and perhaps alſo by the treachery of their commander. This defeat was fatal. The French loſt 3000 men, and 6000 immediately

France. 1793. immediately deserted and went home to France. Dumourier continued to retreat, and on the 22d he was again attacked near Louvain. He now, through the medium of Colonel Mack, came to an agreement with the Imperialists that his retreat should not be seriously interrupted. It was now fully agreed between him and the Imperialists, that while the latter took possession of Condé and Valenciennes, he should march to Paris, dissolve the convention, and place the son of the late king upon the throne.

352 And joins the allies;

The rapid retreat and successive defeats of General Dumourier rendered his conduct suspicious. Commissioners were sent from the executive power for the purpose of discovering his designs. They dissembled, and pretended to communicate to him a scheme of a counter-revolution. He confessed his intention of dissolving the convention and the Jacobin club by force, which he said would not exist three weeks longer, and of restoring monarchy. On the report of these commissioners the convention sent Bournonville the minister of war to supersede and arrest Dumourier, along with Camus, Blancal, La Marque, and Quinette, as commissioners. The attempt on the part of these men was at least hazardous, to say no more of it; and the result was, that on the first of April Dumourier sent them prisoners to General Clairfait's head quarters at Tournay as hostages for the safety of the royal family. He next attempted to seduce his army from their fidelity to the convention; but he speedily found that he had much mistaken the character of his troops. Upon the report that their general was to be carried as a criminal to Paris, they were seized with sudden indignation; but when they found that an attempt was making to prevail with them to turn their arms against their country, their sentiments altered. On the 5th of April, two proclamations were issued; one by General Dumourier, and the other by the prince of Saxe Cobourg, declaring that their only purpose was to restore the constitution of 1789, 1790, and 1791. Prince Cobourg announced that the allied powers wished merely to co-operate with General Dumourier in giving to France her constitutional king and the constitution she had formed for herself, declaring, on his word of honour, that he came not to the French territory for the purpose of making conquests. On the same day Dumourier went to the advanced guard of his own camp at Maulde. He there learned that the corps of artillery had risen upon their general, and were marching to Valenciennes; and he soon found that the whole army had determined to stand by their country. Seven hundred cavalry and 800 infantry was the whole amount of those that deserted with Dumourier to the Austrians, and many of them afterwards returned.

363 but his army refuse to act with him.

354 Proclamations of the Imperial commander in chief.

355 State of France at this period.

By the defection of Dumourier, however, the whole army of the north was dissolved, and in part disbanded, in presence of a numerous, well-disciplined, and victorious enemy. The Prussians were at the same time advancing on the Rhine with an immense force, and about to commence the siege of Mentz. In the interior of the republic more serious evils if possible were arising. In the departments of La Vendée and La Loire, or the provinces of Brittany and Poitou, immense multitudes of emigrants and other royalists had gradually assembled in the course of the winter. They professed to act in the name of Monsieur, as regent of France. About the middle of March they advanced against Nantz to the amount of 40,000. In the beginning of April they defeated the republicans in two pitched battles, and possessed themselves of 50 leagues of country. They even threatened by their own efforts to shake the new republic to its foundation. On the 8th of April a congress of the combined powers assembled at Antwerp. It was attended by the prince of Orange and his two sons, with his excellency Vander Spiegel, on the part of Holland; by the duke of York and Lord Auckland on the part of Great Britain; by the prince of Saxe Cobourg, Counts Metternich, Starenberg, and Mercy Dargenteau, with the Prussian, Spanish, and Neapolitan envoys. It was here determined to commence active operations against France. The prince of Cobourg's proclamation was recalled, and a scheme of conquest announced.

France. 1793.

356 Congress of the combined powers.

Commissioners from the convention now set up the standard of the republic anew, and the scattered battalions flocked around it. General Dampierre was appointed commander, and on the 13th he was able to resist a general attack upon his advanced posts. On the 14th, his advanced guard yielded to superior numbers, but on the 15th was victorious in a long and well-fought battle. On the 23d, the Austrians were again repulsed, and on the 1st of May General Dampierre was himself repulsed in an attack upon the enemy. On the 8th, another engagement took place, in which the French general was killed by a cannon ball. On the 23d, a very determined attack was made by the allies upon the French fortified camp of Famars, which covered the town of Valenciennes. The French were overcome, and in the night abandoned their camp. In consequence of this the allies were enabled to commence the siege of Valenciennes; for Condé had been blockaded from the 1st of April.

357 The republican army again assembled.

About the same time General Custine on the Rhine made a violent but unsuccessful attack upon the Prussians, in consequence of which they were soon enabled to lay siege to Mentz. The Corsican general Paoli revolted at this period; and the new republic, assaulted from without by the whole strength of Europe, was undermined by treachery and faction within.

35 Revolt of Paoli.

While the country was in a state verging upon utter ruin, parties in the convention were gradually waxing more fierce in their animosity; and regardless of what was passing at a distance, they seemed only anxious for the extermination of each other. In the month of March, the celebrated *Revolutionary Tribunal* was established for the purpose of trying crimes committed against the state; and the Girondist party, the mildness of whose administration had contributed not a little to increase the evils of their country, began to see the necessity of adopting measures of severity. But the public calamities, which now rapidly followed each other in succession, were ascribed by their countrymen to their imbecility or perfidy. This gave to the party of the *Mountain* a fatal advantage. On the 15th of April the communes of the 48 sections of Paris presented a petition, requiring that the chiefs of the Girondists therein named should be impeached and expelled from the convention. This was followed up on the 1st of May by another petition from the suburb of St Antoine. The Girondist party in the mean time impeached Marat, but he was acquitted by the jury at his trial. The

359 State of parties in France, and the revolutionary tribunal established.

France. 1793. Mountain, by the assistance of the Jacobin club, had now acquired a complete ascendancy over the city of Paris. The Girondists or Brissotines proposed therefore to remove the convention from the capital; and to prevent this, the *Mountain* resolved to make the same use of the people of the capital against the Girondist party that they had formerly done against the monarch on the 10th of August. It is unnecessary to state in detail all the tumults that occurred either in Paris or in the convention during the remaining part of the month of May. On the 31st, at four o'clock in the morning, the tocsin was sounded, the generale was beat, and the alarm guns fired. All was commotion and terror. The citizens flew to arms, and assembled round the convention. Some deputations demanded a decree of accusation against 35 of its members. The day, however, was spent without decision. On the afternoon of the 1st of June an armed force made the same demand. On the 2d of June this was repeated, the tocsin again sounded, and an hundred pieces of cannon surrounded the national hall. At last Barrere mounted the tribune. He was considered as a moderate man, and respected by both parties; but he now artfully deserted the Girondists. He invited the denounced members voluntarily to resign their character of representatives. Some of them complied, and the president attempted to dissolve the sitting; but the members were now imprisoned in their own hall. Henriot, commander of the armed force, compelled them to remain; and the obnoxious deputies, amounting to upwards of 90 in number, were put under arrest, and a decree of denunciation against them signed.

360 The Mountain party get the upper hand. It is obvious, that on this occasion the liberties of France were trodden under foot. The minority of the national representatives, by the assistance of an armed force raised in the capital, compelled the majority to submit to their measures, and took the leading members prisoners. Thus the city of Paris assumed to itself the whole powers of the French republic; and the nation was no longer governed by representatives freely chosen, but by a minority of their members, whose sentiments the city of Paris and the Jacobin club had thought fit to approve of. Human history is a mass of contradictions. The *Mountain* party came into power by preaching liberty, and by violating its fundamental principles. How far the plea of political necessity may excuse their conduct, we shall not venture to decide explicitly. Certain it is, however, that they soon commenced, both at home and abroad, a career of the most terrible energy that is to be found in the annals of nations.

361 Several cities and departments revolt in consequence. The first result of their victory in the capital was calamitous to the republic at large. Brissot and some other deputies escaped, and endeavoured to kindle the flames of civil war. In general, however, the influence of the Jacobin club, and of its various branches, was such, that the north of France adhered to the convention as it stood; but the southern departments were speedily in a state of rebellion. The department of Lyons declared the *Mountain* party outlawed. Marseilles and Toulon followed the example of Lyons, and entered into a confederacy, which has since been known by the appellation of *Fœderalism*. The departments of La Gironde and Calvades broke out into open revolt. In short, the whole of France was in a state of violent convulsion. Still, however, the enthusiastic garrisons of Mentz and Valenciennes protected it against the immediate entrance of a foreign force, and allowed leisure for one of its internal factions to gain an ascendancy, and thereafter to protect its independence. In the mean time, the political enthusiasm of all orders of persons was such, that even the female sex did not escape its contagion. A young woman of the name of Charlotte Cordé, in the beginning of July, came from the department of Calvades to devote her life for what she thought the cause of freedom and of her country. She requested an interview with *Marat*, the most obnoxious of the Mountain party. Having obtained it, and conversed with him calmly for some time, she suddenly plunged a dagger in his breast, and walked carelessly out of the house. She was immediately seized and condemned. At the place of execution she behaved with infinite constancy, shouting *Vive la republique*. The remains of Marat were interred with great splendor, and the convention attended his funeral. His party perhaps derived advantage from the manner of his death, as it seemed to fasten the odious charge of assassination upon their antagonists, and gave them the appearance of suffering in the cause of liberty. The truth is, that assassination was sanctioned by both parties under pretence of defending the liberties of the republic.

France. 1793.

362 Marat murdered by a woman.

363 The republican constitution finished by the Mountain. One of the first acts of the Mountain junto after their triumph was to finish the republican constitution. Previous to their fall, the Girondists had brought forward the plan of a constitution, chiefly the work of Condorcet; but it was never sanctioned by the convention, and was too intricate to be practically useful. The new constitution now framed, which was afterwards sanctioned by the nation, but was never put in practice, abolished the former mode of electing the representatives of the people through the medium of *electoral* assemblies, and appointed them to be chosen immediately by the *primary* assemblies, which were to consist of from 200 to 600 citizens, each man voting by ballot or open vote at his option. There was one deputy for every 40,000 individuals, and population was the sole basis of representation. The elections were to take place every year on the 1st of May. Electoral assemblies were, however, retained for one purpose. Every 200 citizens in the primary assemblies named one elector; and an assembly of all the electors of the department was afterwards held, which elected candidates for the *executive council*, or ministry of the republic. The legislative body chose out of all this list of candidates the members of the executive council. One half of this council was renewed by each legislature in the last month of the session. Every law, after being passed by the legislative body, was sent to the department. If in more than half of the departments the tenth of the primary assemblies of each did not object to it, it became effectual. Trial by jury was established. National conventions might be called for altering the constitution, and were to be called, if required by the tenth of the primary assemblies of each department in a majority of the departments.

The publication of this constitution procured no small degree of applause to the convention and the Mountain party. The rapidity with which it was formed (being only a fortnight) seemed to cast a just reproach upon the slowness of their antagonists, and it was regarded as a proof of their being decidedly se-

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rious in the cauſe of republicaniſm. No regard, however, was paid to it by the convention, which declared itſelf permanent, nor indeed did it ſeem poſſible to carry it into execution.

364 Fall of Conde and Valenciennes.

We have mentioned that Condé was inveſted from the beginning of April. It did not yield till the 10th of July, when the garriſon was ſo much reduced by famine and diſeaſe, that out of 4000 men, of which it originally conſiſted, only 1500 were fit for ſervice. The eyes of all Europe were in the mean time fixed upon the ſiege of Valenciennes. Colonel Monerieff had contended, that batteries ought immediately to be placed under the walls without approaching it by regular parallels; but the Imperial engineer Mr Ferraris aſſerted, that the work of the great Vauban muſt be treated with more reſpect; and his opinion was adopted by the council of war. The trenches were opened on the 14th of June. Few ſallies were attempted by the garriſon, on account of the ſmallneſs of their number. The inhabitants at firſt wiſhed to ſurrender; but the violence of the bombardment prevented their aſſembling or giving much trouble on that head to General Ferrand the governor. Much of the labour of the ſiege conſiſted of mines and countermines. Some of theſe having been ſucceſsfully ſprung by the allies, the town was ſurrendered on the 27th of July by capitulation to the duke of York, who took poſſeſſion of it in behalf of the emperor of Germany. The ſiege of Mentz was at the ſame time going on. It ſuffered much from famine. At laſt, after an unſucceſsful attempt by the French army on the Rhine for its relief, it ſurrendered on the 22d of July.

365 The allied powers divided as to their future proceeding.

At the termination of the ſiege of Valenciennes it would appear that the allied powers were at a loſs how to proceed next. The Auſtrian commanders are ſaid to have preſented two plans: The firſt was to penetrate to Paris by the aſſiſtance of the rivers which fall into the Seine; the other was to take advantage of the conſternation occaſioned by the ſurrender of Valenciennes, and with 50,000 light troops to penetrate ſuddenly to Paris, while a debarkation ſhould be made on the coaſt of Brittany to aſſiſt the royaliſts. The propoſal of the Britiſh miniſtry was, however, adopted, which was, to divide the grand army, and to attack Weſt Flanders, beginning with the ſiege of Dunkirk. This determination proved ruinous to the allies. The French found means to vanquiſh in detail that army, which they could not encounter when united.

366 Unfortunate conſequences of the diviſion of their forces.

It has been ſaid that the duke of York was in ſecret correſpondence with Omeron the governor of Dunkirk; but the latter was removed before any advantage could be taken of his treachery. On the 24th of Auguſt the duke of York attacked and drove the French outpoſts into the town, after an action in which the Auſtrian general Dalton was killed. A naval armament was expected from Great Britain to co-operate in the ſiege, but it did not arrive. In the mean time, a ſtrong republican force menaced the covering army of the allies, which was commanded by General Freytag. He was ſoon attacked and totally routed. The ſiege was raiſed. The Britiſh loſt their heavy cannon and baggage, with ſeveral thouſand men; and the convention, believing that their general Houchard could have cut off the duke of York's retreat, tried and executed him for this neglect of duty.

Prince Cobourg and General Clairfait in the mean time unſucceſsfully attempted to beſiege Cambray and Bouchain. Queſnoy was, however, taken by General Clairfait on the 11th of September; and here finally terminated for the preſent campaign the ſucceſs of the allies in the Netherlands.

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A conſiderable part of the French army of the north took a ſtrong poſition near Maubeuge, where they were blockaded by Prince Cobourg; but upon the 15th and 16th of October he was repeatedly attacked by the French troops under General Jourdan, who ſucceeded Houchard. The French had now recovered their vigour. They brought into the field a formidable train of artillery, in which were many 24 pounders. Commiſſioners from the convention harangued the ſoldiers, threatened the fearful, and applauded the brave. Crowds of women, without confuſion, went through the ranks, diſtributing ſpirituous liquors in abundance, and carrying off the wounded. The attacks were repeated and terrible on both ſides; but the Auſtrians had conſiderably the diſadvantage, and Prince Cobourg retired during the night. The French now menaced maritime Flanders. They took Furnes and beſieged Nieuport. A detachment of Britiſh troops ready to ſail to the Weſt Indies were haſtily ſent to Oſtend, and prevented for the preſent the farther progreſs of the French.

Such was the multiplicity of the events that now occurred in France, that it is difficult to ſtate the outlines of them with any tolerable perſpicuity. We have already mentioned the extenſive diſſenſions that occurred throughout the republic in conſequence of the triumph of the Mountain party on the 31ſt of May. The department of Calvades was firſt in arms againſt the convention under the command of General Felix Wimpfen; but before the end of July the inſurrection was quieted, after a few ſlight ſkirmiſhes. But the fœderaliſm of the cities of Marſeilles, Lyons, and Toulon, ſtill remained. Lyons was attacked on the 8th of Auguſt by the conventional troops. Several actions followed, which were attended with great loſs both on the part of the aſſailants and of the beſieged. The city was reduced almoſt to ruins; but it held out during the whole month of September. The beſieging general Kellerman was removed from his command, on account of his ſuppoſed inactivity; and the city ſurrendered on the 8th of October to General Doppet, a man who had lately been a phyſician. Such was the rage of party zeal at this time, that the walls and public buildings of Lyons were ordered to be deſtroyed, and its name changed to that of *Ville Affranchie*. Many hundreds of its citizens were dragged to the ſcaffold on account of their alleged treaſonable reſiſtance to the convention. The victorious party, wearied by the ſlow operation of the *guillotine*, at laſt deſtroyed their priſoners in multitudes, by firing grape-ſhot upon them. Such indeed was the unrelenting character of the Mountain at this time, not only here but through the whole republic, that they themſelves pretended not to excuſe it, but declared that terror was with them *the order of the day*.

367 Lyons beſieged by the conventional troops, and taken.

368 Unrelenting character of the conquerors.

In the end of July General Cartaux was ſent againſt Marſeilles. In the beginning of Auguſt he gained ſome ſucceſſes over the advanced fœderaliſt troops. On the 24th he took the town of Aix, and the Marſeillois

369 The Marſeillois obliged to ſubmit.

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submitted. But the leading people of the important town and harbour of Toulon entered into a negociation, and submitted to the Britiſh admiral Lord Hood, under condition that he ſhould preſerve as a depoſit the town and ſhipping for Louis XVII. and under the ſtipulation that he ſhould aſſiſt in reſtoring the conſtitution of 1789. The ſiege of Toulon was commenced by General Cartaux in the beginning of September. It continued without much vigour during that and the whole of the ſucceeding month. Neapolitan, Spaniſh, and Engliſh troops, were brought by ſea to aſſiſt in its defence. In the beginning of November, General Cartaux was removed to the command of the army in Italy, and General Dugommier ſucceeded him. General O' Hara arrived with reinforcements from Gibraltar, and took upon him the command of the town, under a commiſſion from his Britannic majeſty. On the 30th of November, the garriſon made a powerful ſally to deſtroy ſome batteries that were erecting upon heights which commanded the city. The French were ſurpriſed, and the allies ſucceeded completely in their object; but, elated by the facility of their conqueſt, the allied troops ruſhed forward in purſuit of the flying enemy, contrary to their orders, and were unexpectedly met by a ſtrong French force that was drawn out to protect the fugitives. General O'Hara now came from the city to endeavour to bring off his troops with regularity. He was wounded in the arm and taken priſoner. The total loſs of the allies in this affair was eſtimated at nearly one thouſand men. The French had now muſtered in full force around Toulon, and prepared for the attack. It was begun on the 19th of December in the morning, and was chiefly directed againſt Fort Mulgrave, defended by the Britiſh. This fort was protected by an entrenched camp, 13 pieces of cannon, 36 and 24 pounders, &c. 5 mortars, and 3000 troops. Such was the ardour of aſſault, that it was carried in an hour, and the whole garriſon was deſtroyed or taken. The allies now found it impoſſible to defend the place; and in the courſe of the day embarked their troops, after having ſet on fire the arſenal and ſhips. A ſcene of confuſion here enſued, ſuch as has not been known in the hiſtory of modern wars. Crowds of people of every rank, age, and ſex, hurried on board the ſhips, to avoid the vengeance of their enraged countrymen. Some of the inhabitants began to fire upon their late allies; others in deſpair were ſeen plunging into the ſea, making a vain effort to reach the ſhips; or putting an end at once to their own exiſtence upon the ſhore. Thirty-one ſhips of the line were found by the Britiſh at Toulon; thirteen were left behind; ten were burnt; four had been previouſly ſent to the French ports of Breſt and Rochefort, with 5000 republicans who could not be entruſted; and Great Britain finally obtained by this expedition only three ſhips of the line and five frigates.

370 Toulon conditionally ſubmits to Lord Hood,

371 who is at length obliged to evacuate it.

On the ſide of Spain the war produced nothing of importance; and in the mountainous country of Piedmont it went on ſlowly. Nice and Chamberry were ſtill retained by the French; but more terrible ſcenes were acting in other quarters. In La Vendée a moſt bloody war was perſiſted in by the royaliſts. In that quarter of the country the language of the reſt of France is little underſtood. The people were ſuperſtitious, and had acquired little idea of the new opinions that had lately been propagated in the reſt of the empire. They were chiefly headed by prieſts, and regarded their cauſe as a religious one. Their mode of warfare uſually was, to go on in their ordinary occupations as peaceable citizens, and ſuddenly to aſſemble in immenſe bands, inſomuch that at one time they were ſaid to amount to 150,000 men. They beſieged Nantz and the city of Orleans, and even Paris itſelf was not thought altogether ſafe from their enterpriſes. The war was inconceivably bloody. Neither party gave quarter; and La Vendée proved a dreadful drain to the population of France. On the 28th of June, the conventional general Biron drove the royaliſts from Lucon; and Nantz was relieved by General Beyſſer. After ſome ſucceſs, General Weſterman was ſurpriſed by them, and compelled to retreat to Parthenay. In the beginning of Auguſt the royaliſts were defeated by General Roſſignol; but on the 10th of that month, under Charette their commander in chief, they again attacked Nantz, but ſuffered a repulſe. It would be tedious to give a minute detail of this obſcure but cruel war. The royaliſts were often defeated and ſeemingly diſperſed, but as often aroſe in crowds around the aſtoniſhed republicans. At laſt, however, about the middle of October, they were completely defeated, driven from La Vendée, and forced to divide into ſeparate bodies. One of theſe threw itſelf into the iſland of Noirmoutier, where they were ſubdued; another took the road of Maine and Brittany, where they ſtruggled for ſome time againſt their enemies, and were at laſt cut to pieces or diſperſed.

372 Proceedings of the royaliſts in La Vendée.

The royaliſts had long expected aſſiſtance from England; and an armament under the carl of Moira was actually fitted out for that ſervice, but it did not arrive till too late, and returned home without attempting a landing. The Mountain party always diſgraced their ſucceſſes by dreadful cruelties. Humanity is ſhocked, and hiſtory would almoſt ceaſe to obtain credit, were we to ſtate in detail the unrelenting cruelties which were exerciſed againſt the unfortunate royaliſts, chiefly by Carrier, a deputy from the convention, ſent into this quarter with unlimited powers. Multitudes of priſoners were crowded on board veſſels in the Loire, after which the veſſels were ſunk. No age or ſex was ſpared; and theſe executions were performed with every circumſtance of wanton barbarity and inſult.

373 Horrid cruelty of the Mountain party.

On the ſide of the Rhine a great variety of events occurred during the months of Auguſt and September. Several engagements at firſt took place, in which the French were, upon the whole, ſucceſsful. In September, however, Landau was inveſted by the combined powers; and it was reſolved to make every poſſible effort to drive the French from the ſtrong lines of Weiſſembourg, on the river Lauter. On the 13th of October, the Auſtrian general Wurmſer made a grand attack upon theſe lines. The French ſay that their generals betrayed them, and ſuffered the lines to be taken almoſt without reſiſtance. The general of the allies confeſſed that the lines might have held out for ſeveral days. The French retreated to Hagenau, from which they were driven on the 18th; and ſuffered two other defeats on the 25th and 27th. Some of the principle citizens of Straſburg now ſent a private deputation to General Wurmſer, offering to ſurrender the town, to be preſerved as a depoſit to be reſtored to Louis

374 Progreſs of the allies on the Rhine.

France. 1793. Louis XVII. General Wurmſer refuſed to accept of it upon theſe terms, inſiſting upon an abſolute ſurrender to his Imperial Majeſty. In conſequence of the delay occaſioned by diſagreement, the negociation was diſcovered, and the citizens of Straſbourg engaged in the plot were ſeized by St Juſt and Lebas, commiſſioners from the convention, and brought to the ſcaffold. Prodigious efforts were now made by the French to recover their ground in this quarter. General Irembert was ſhot at the head of the army on the 9th of November, upon a charge, probably ill-founded, of treachery in the affair of the lines of Weiſſembourg. On the 14th, however, Fort Louis was taken by the allies, not without ſuſpicion of treachery in the governor. But here the ſucceſs of General Wurmſer might be ſaid to terminate. On the 21ſt the republican army drove back the Auſtrians, and penetrated almoſt to Hagenau. An army from the Moſelle now advanced to co-operate with the army of the Rhine. On the 17th the Pruſſians were defeated near Sarbruck. Next day their camp at Bliſcaſtel was ſtormed, and the French advanced to Deux Ponts. On the 29th and 30th the French were repulſed with great loſs in two violent attacks made on the duke of Brunſwick near Lautern. But it now appeared that the French had come into the field with a determination to conquer whatever it might coſt. Every day was a day of battle, and torrents of blood were ſhed on both ſides. The allies had the advantage of poſſeſſing the ground, which, in that quarter, at ſuch a late ſeaſon of the year, is very ſtrong on account of its inequalities and moraſſes. In military ſkill, the French officers and thoſe of the allies were perhaps nearly equal; but the French army was by far the moſt numerous; and although not a match in point of diſcipline, yet it derived no ſmall ſuperiority from the enthuſiaſm with which the troops were animated. On the 8th of December, under the command of General Pichegru, the French carried the redoubts which covered Hagenau by means of the bayonet.

375 The French at length ſucceſsful in that quarter.

This modern inſtrument of deſtruction, againſt which no defenſive weapon is employed, is always moſt ſucceſsful in the hands of the moſt intrepid; and it was now a dreadful engine in the hands of French enthuſiaſm.—The fineſt troops that ever Europe produced were unable to withſtand the fury of the republicans, which ſeemed only to increaſe in proportion to the multitude of companions that they loſt. On the 22d the allies were driven with immenſe ſlaughter from Hagenau, notwithſtanding the immenſe works they had thrown up for their defence. The entrenchments on the heights of Reiſhoffen, Jauderſhoffen, &c. were conſidered as more impregnable than thoſe of Jemappe. They were ſtormed by the army of the Moſelle and the Rhine, under Generals Hoche and Pichegru. On the 23d and 24th, the allies were purſued to the heights of Wrotte. On the 26th, the entrenchments there were forced by the bayonet, after a deſperate conflict. On the 27th, the republican army arrived at Weiſſembourg in triumph. General Wurmſer retreated acroſs the Rhine, and the duke of Brunſwick haſtily fell back to cover Mentz. The blockade of Landau, which had laſted four months, was raiſed. Fort Louis was evacuated by the allies, and Kaiſerſlatern, Germerſheim, and Spires, ſubmitted to the French.—During this laſt month of the year 1793, the loſs of men on both ſides in this quarter was immenſe, and unexampled in the hiſtory of modern war. It is even ſaid that it might amount to more than 70,000 or 80,000 men.

France. 1793.

Thus far we have attended to the military affairs of the republic for ſome time paſt. Very violent efforts were in the mean time made at Paris by the new adminiſtration, eſtabliſhed under the auſpices of the Jacobin club, and of the party called the *Mountain*. The new republican conſtitution had been preſented to the people in the primary aſſemblies, and accepted. The buſineſs, therefore, for which the convention was called together, that of forming a conſtitution for France, was at an end; and it was propoſed that they ſhould diſſolve themſelves, and order a new legiſlative body to aſſemble, according to the rules preſcribed by that conſtitution. This was, no doubt, the regular mode of procedure; but the ruling party conſidered it as hazardous to convene a new aſſembly, poſſeſſing only limited powers, in the preſent diſtracted ſtate of the country. It was indeed obvious, that France at this time ſtood in need of a dictatorſhip, or of a government poſſeſſed of more abſolute authority than can be enjoyed by one that acts, or even pretends to act, upon the moderate principles of freedom. It was therefore determined that the convention ſhould remain undiſſolved till the end of the war; and that a *revolutionary* government, to be conducted by its members, ſhould be eſtabliſhed, with uncontrouled powers. Committees of its own body were ſelected for the purpoſe of conducting every department of buſineſs. The chief of theſe committees was called the *committee of public ſafety*. It ſuperintended all the reſt, and gave to the adminiſtration of France all the ſecrecy and diſpatch which have been accounted peculiar to a military government, together with a combination of ſkill and energy hitherto unknown among mankind. A correſpondence was kept up with all the Jacobin clubs throughout the kingdom. Commiſſioners from the convention were ſent into all quarters, with unlimited authority over every order of perſons. Thus a government poſſeſſed of infinite vigilance, and more abſolute and tyrannical than that of any ſingle deſpot, was eſtabliſhed; and the whole tranſactions and reſources of the ſtate were known to the rulers. On the 23d of Auguſt, Barrere, in name of the committee of public ſafety, procured the celebrated decree to be paſſed for placing the whole French nation in a *ſtate of requiſition* for the public ſervice. "From this moment (ſays the decree) till that when all enemies ſhall have been driven from the territory of the republic, all Frenchmen ſhall be in permanent readineſs for the ſervice of the army. The young men ſhall march to the combat; the married men ſhall forge arms, and tranſport the proviſions; the women ſhall make tents and clothes, and attend in the hoſpitals; the children ſhall make lint of old linen; the old men ſhall cauſe themſelves to be carried to the public ſquares, to excite the courage of the warriors, to preach hatred againſt the enemies of the republic; the cellars ſhall be waſhed to procure ſaltpetre; the ſaddle-horſes ſhall be given up to complete the cavalry; the unmarried citizens, from the age of 18 to 25, ſhall march firſt, and none ſhall ſend a ſubſtitute; every battalion ſhall have a banner, with this inſcription, *The French nation riſen againſt tyrants.*" The decree alſo regulates the mode of organizing this maſs. A decree more tyrannical

376 Violent efforts of the Mountain party.

377 France declared to be in a ſtate of requiſition.

France. 1793.

rannical than this was never made by an eaſtern deſpot; and when it was firſt publiſhed, foreigners were at a loſs whether to regard it as a ſublime effort of a powerful government, or as a wild project which could produce nothing but confuſion. The effects of it, however, have been truly terrible. We have already mentioned ſome of them in the bloody conteſt which occurred upon the Rhine, and Europe was ſoon deſtined to bear witneſs to ſtill more extraordinary events.

378 General Cuſtine tried and executed.

In the end of July, General Cuſtine was brought to trial, and executed, in conſequence of a variety of accuſations of infidelity to his truſt and diſreſpect to the convention.

379 Murder of the queen.

The queen was next brought to trial before the revolutionary tribunal, on the 15th of October. The charges againſt her were very various; but the chief tendency of them was to prove that ſhe had always been hoſtile to the revolution, and had excited all the efforts that had been made by the court againſt it. On the 16th of October, this beautiful woman, whom fortune once placed ſo high, ended her days on a ſcaffold, after a mock trial, in which no regard was paid either to juſtice or decency. She behaved with much dignity and compoſure, and appeared deeply impreſſed with a ſenſe of religion.

380 Execution of the heads of the Girondiſt party,

The members of the convention who had been at the head of the Girondiſt party, and had either been detained in priſon ſince the 31ſt of May, or ſeized in the departments to which they had retired, were afterwards brought to trial. On the 30th of October, 21 of them were executed, viz. Briſſot, Vergniaud, Genſonné, Duprat, Lehardi, Ducos, Fonfrede, Boliеau, Gardien, Duchatel, Sillery, Fauchet, Dufriche, Duperret, La Source, Carra, Beauvais, Mainville, Antiboul, Vigée, and Laeaze. Seventy-one were ſtill detained in confinement.

381 and of the duke of Orleans.

The duke of Orleans was afterwards condemned, on a charge of having aſpired to the ſovereignty from the beginning of the revolution. His execution gave ſatisfaction to all parties. His vote for the puniſhment of death upon the trial of the late king had done him little honour even in the opinion of the Mountain, and had rendered him odious to all the reſt of mankind.

382 Executions become prodigiouſly common.

The execution of perſons of all ranks, particularly of prieſts and nobles, became now ſo common, that it would be in vain to attempt to give any detail of them. Every perſon brought before the revolutionary tribunal was condemned as a matter of courſe. The Jacobins ſeemed inſatiable in their thirſt after blood, and the people at large appeared to regard their conduct with unaccountable indifference.

383 A new table of weights and meaſures eſtabliſhed.

When the human mind is once rouſed, its activity extends to every object. At this time a new table of weights and meaſures was eſtabliſhed by the convention, in which the decimal arithmetic alone is employed. The court of Spain had the liberality, notwithſtanding the war, to ſuffer M. Mechain to proceed in his operations for meaſuring a degree of the meridian in that country. He carried on his ſeries of triangles from Barcelona to Perpignan; and from this place the menſuration was continued to Paris. M. de Lambre, and his pupil M. la Francois, alſo meaſured a degree of latitude in the vicinity of the metropolis. In all, 12 degrees of the meridian were meaſured; of which the mean is 57027 toiſes, and by this the univerſal ſtandard of meaſure is calculated. M. M. de Borda and Caſſini determined the length of a pendulum that ſwings ſeconds, *in vacuo*, and in a mean temperature at Paris, to be 3 feet and 8,06 lines. M. M. Lavoiſier and Hauy found that a cubic foot of diſtilled water at the freezing point weighs *in vacuo* 70 pounds and 60 gros French weight. We ſhall inſert a table of the meaſures and weights now eſtabliſhed.

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Long Measure.

Metres.		*French Toiſes.*
10,000,000 =	a quadrant of the meridian, which is the principle on which the new meaſure is founded	5132430
100,000 =	an hundredth part of a quadrant, or decimal degree of the meridian	51324
1000 =	a *milliare*, or mile	513
100 =	a ſtadium } Agrarian	51.3243
10 =	a perch } meaſure	5.13243

		Feet.	*Inch.*	*Lines.*
1 =	a *metre*, or rectilineal unit	3	0	11.44
$\frac{1}{10}$ or 0.1 =	a *decimetre*, or palm	0	3	8.344
$\frac{1}{100}$ or 0.01 =	a *centimetre*, or digit	0	0	4.434
$\frac{1}{1000}$ or 0.001 =	a *millemetre*	0	0	.443

Superficial Measure.

Sq. Metres.		*Sq. Feet.*
10,000 =	an *are*, or ſuperficial unit, being a ſquare the ſide of which is 100 metres in length	94831
1000 =	a *deciare*, or tenth of an *are*; a ſuperficies an hundred metres long, and ten broad	9483.1
100 =	a centiare	948.31

Measures of Capacity.

Cub. decimetres.		*Paris Pints.*	*Paris Buſh.*
1000 =	the cubic *metre*, or cade or tun	$1051\frac{1}{2}$	78.9
100 =	*dedicade*, or *ſetier*	$105\frac{1}{7}$	7.89
10 =	*centicade*, or buſhel	$10\frac{1}{2}$	.789
1 =	cubic *decimetre*, or	$1\frac{1}{20}$	.0789

Weights.

Cub. decimetres of water.		*French Pounds.*
1000 =	the weight of a cubic *metre*, or cade of water, is called a *bar* or *millier*	2044.4
100 =	$\frac{1}{10}$ of a *bar*, or *decibar*, or quintal	204.44
10 =	$\frac{1}{100}$ of a *bar*, or centibar, or *decal*	20.444

		lb.	*oz.*	*gros.*	*grains.*
1 =	the weight of a cubic decimetre of water is called a *grave*, or pound	2	8	5	49
.1 =	$\frac{1}{10}$ of *grave*, or *decigrave*, or ounce	0	3	2	12.1
.01 =	$\frac{1}{100}$ of a *grave*, or centigrave, or dram	0	0	2	44.41
.001 =	the weight of a cubic *centimetre* of water, is named a *gravet*, or maille	0	0	0	18.841
.0001 =	*decigravet*, or grain	0	0	0	1.8841
.00001 =	*centigravet*	8	0	0	0.18841

France. 1793. A piece of silver coin weighing a *centigrave*, and a *franc* of silver, according to the former standard, will be worth 40 sols 10⅔ deniers. The *milliare*, or thousand *metres*, is substituted for the mile; and the *are* for the arpent in land-measure. The latter two are to each other as 49 to 25. The astronomical circles with which M. M. de Borda and Cassini made the observations, are divided according to this plan. The quadrant contains 100 degrees, and each degree 100 minutes. Hence the minute of a great circle on our globe is equal to a *milliare*, or new French mile. If, for the reduction of this measure, we estimate the Paris toise, according to the comparison made with the standard kept in the Royal Society of London, at 6.3925 English feet, the *milliare* or minute will be equal to 1093.633 yards, and the *metre* 3.280899 feet.

384 A new kalendar formed. At the same period a new kalendar was formed.—By it the year is made to begin with the autumnal equinox, and is divided into 12 months. These are called Vindemiaire, Brumaire, Frimaire, Nivose, Ventose, Pluviose, Germinal, Floreal, Prairial, Messidor, Thermidor, and Fructidor. The months consist of 30 days each, and are divided into three decades. The days of each decade are known by the names of Primidi, Duodi, Tridi, &c. to Decadi; and the day of rest is appointed for every tenth day, instead of the seventh. The day (which begins at midnight) is distributed into ten parts, and these are decimally divided and subdivided. Five supernumerary days are added every year after the 30th of Fructidor. To these is given the absurd appellation of *Sans Culotides*, a word borrowed from a term of reproach (*sans culotte*), which had often been bestowed on the republican party from the meanness of their rank and fortune; but which that party now attempted to render honourable and popular. The childish folly of this innovation has struck every person with surprise, as it can serve no good purpose whatever. It is a wonderful instance of the waywardness of the human mind, which can occupy itself one moment with deeds of savage barbarity, and the next with a matter so unimportant as the artificial division of time.

385 Decay of religion. The religion of France had been gradually losing its influence; and on the 7th of November, Gobet, bishop of Paris, along with a great multitude of other ecclesiastics, came into the hall of the convention, and solemnly resigned their functions and renounced the Christian religion. All the clergymen, whether Protestant or Catholic, that were members of the convention, followed this example, excepting only Gregoire, whom we formerly mentioned as having been one of the first priests that joined the *Tiers Etat* after the meeting of the States General. He had the courage to profess himself a Christian, although he said that the emoluments of his bishopric were at the service of the republic. With the acclamations of the convention, it was decreed that the only French deities hereafter should be Liberty, Equality, Reason, &c. and they would seem to have consecrated these as a kind of new objects of worship.—What political purpose the leaders in the convention intended to serve by this proceeding does not clearly appear; unless, perhaps, their object was to render the French manners and modes of thinking so completely new, that it should never be in their power to return to the state from which they had just emerged, or to unite in intercourse with the other nations of Europe. The populace, however, could not at once relinquish entirely the religion of their fathers. The commune of Paris ordered the churches to be shut up, but the convention found it necessary to annul this order; and Robespierre gained no small degree of popularity by supporting the liberty of religious worship on this occasion. Hebert and Fabre d'Eglantine, who led the opposite party, hastened their own fall by this ill-judged contempt of popular opinion. France. 1794.

386 Quarrels between the Mountain and Jacobins. For, now that the republic saw itself successful in all quarters, when the Mountain party and the Jacobins had no rival at home, and accounted themselves in no immediate danger from abroad, they began to split into factions, and the fiercest jealousies arose. The Jacobin club was the usual place in which their contests were carried on; and at this time Robespierre acted the part of a mediator between all parties. He attempted with great art to turn their attention from private animosities to public affairs. He spread a report that an invasion of Great Britain was speedily to take place. He therefore proposed that the Jacobin club should set themselves to work to discover the vulnerable parts of the British constitution and government. They did so: They made speeches, and wrote essays without number. And in this way was the most fierce and turbulent band of men that ever perhaps existed in any country occupied and amused for a very considerable time. What is no less singular, a great number of British subjects favoured the plans of these reforming Atheists, and, under the specious appellation of the *Friends of the People*, acted in concert with the French Jacobins.

387 A provisional acknowledgement of the republic by the allies rejected by the convention. The winter passed away in tolerable quietness, and no military enterprise was undertaken either by the allies or by the French. On the 1st of February, Barrere asserted in the convention that the confederate powers were willing *provisionally* to acknowledge the French republic, to consent to a cessation of hostilities for two years, at the end of which a lasting peace should be ratified by the French people. But this proposal the convention declared itself determined to reject, as affording to the other nations of Europe the means of undermining their new government.

388 Vigorous state of the revolutionary government. In the mean time, the revolutionary government was gradually becoming more vigorous. Thirty committees of the convention managed the whole business of the state, without sharing much of the direct executive government, which rested in the committee of public safety. These different committees were engaged in the utmost variety of objects. The ruling party had no competitors for power. Without confusion or opposition, therefore, the most extensive plans were rapidly carried into effect. The convention was little more than a court in which every project was solemnly registered. In the same session 30 decrees would sometimes be passed upon objects the most widely different.

389 Management of the finances and other resources of the nation. The finances were under one committee, at the head of which was Cambon.—This committee found resources for the most lavish expenditure. The assignats were received as money throughout the state; and thus a paper mill was said to have become more valuable than a mine of gold. Their credit was supported by an arbitrary law regulating the *maximum* or highest price of all provisions, and by the immense mass of wealth which had come into the hands of the convention by seizing the church lands, and by confiscating

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confiſcating the property of royaliſts, emigrants, and perſons condemned by the revolutionary tribunal. So unequally had property been divided under the ancient government, that by means of theſe confiſcations about ſeven-tenths of the national territory was ſuppoſed to be in the hands of the public. To this was added the plunder of the churches, conſiſting of gold and ſilver ſaints, and utenſils employed in divine worſhip, along with other articles of leſs value; among which may be mentioned the innumerable church bells, which were regarded as ſufficient for the manufacture of 15,000 pieces of cannon. Theſe reſources formed a maſs of property ſuch as never was poſſeſſed by any government.

Other committees were engaged in very different objects. Highways were conſtructed, and canals planned and cut throughout the country. Immenſe manufactories of arms were everywhere eſtabliſhed. At Paris alone 1100 muſkets were daily fabricated, and 100 pieces of cannon caſt every month. Public ſchools were aſſiduouſly inſtituted, and the French language taught in its purity from the Pyrenees to the Rhine. The French convention poſſeſſed immenſe reſources, and they did not heſitate to laviſh them upon their ſchemes. Every ſcience and every art was called upon for aid, and the moſt accompliſhed men in every profeſſion were employed in giving ſplendour to their country. The chemiſts, in particular, gave eſſential aid by the facility with which they ſupplied materials for the manufacture of gun-powder; and in return for their ſervices, Lavoiſier, the greateſt of them, ſuffered death by a moſt iniquitous ſentence. Not fewer than 200 new dramatic performances were produced in leſs than two years; the object of which was to attach the people to the preſent order of things. The vigour with which the committees of ſubſiſtence exerted themſelves is particularly to be remarked. As all Europe was at war with France, and as England, Holland, and Spain, the three maritime powers, were engaged in the conteſt, it had been thought not impoſſible to reduce France to great diſtreſs by famine, eſpecially as it was imagined that the country had not reſources to ſupply its immenſe population. But the preſent leaders of that country acted with the policy of a beſieged garriſon. They ſeized upon the whole proviſions of the country, and carried them to public granaries. They regiſtered the cattle, and made their owners reſponſible for them.—They provided the armies abundantly, and, as the people were accurately numbered, they dealt out in every diſtrict, on ſtated occaſions, what was abſolutely neceſſary for ſubſiſtence, and no more. To all this the people ſubmitted; and, indeed, throughout the whole of the mixed ſcenes of this revolution, the calm judgment of the hiſtorian is not a little perplexed. We cannot avoid admiring the patience with which the people at large endured every hardſhip that was repreſented as neceſſary to the common cauſe, and the enthuſiaſtic energy with which they laviſhed their blood in defence of the independence of their country. At the ſame time we muſt regard with indignation and diſguſt the worthleſs intrigues by means of which the ſanguinary factions in the convention and the capital alternately maſſacred each other.

390 Diſſenſions of the Jacobins increaſe.

During the winter the diſſenſions of the Jacobins ſtill increaſed. They were divided into two clubs, of which the new one aſſembled at a hall which once belonged to the Cordeliers. The leaders of it were Hebert, Ronſin, Vincent, and others; but the old ſociety retained its aſcendency, and Robeſpierre was now decidedly its leader. This extraordinary man had gradually accumulated in his own perſon the confidence of the people and the direction of the government. As the committees were above the convention, which was become little more than a ſilent court of record, ſo the committee of public ſafety was above the other committees. Robeſpierre was the leader of this ruling committee. Barrere, St Juſt, Couthon, and others of its members, only acted a ſecondary part. They laboured in the buſineſs of the ſtate, but the radical power was with Robeſpierre. He ſurrounded the members of the convention with ſpies. He was jealous and implacable, and ſet no bounds to the ſhedding of blood. On the 25th of March he brought to trial the following active Jacobins, who were condemned and executed on the following day: Hebert, Ronſin, Momoro, Vincent, Du Croquet, Koch, Col. Laumur, M. M. Bourgeois, Mazuel, La Boureau, Ancard, Le Clerc, Proly, Deſſieux, Anacharſis Cloots, Pereira, Florent, Armand, Deſcombles, and Dubuiſſon. Not ſatisfied with this, on the 2d of April he brought to trial nine of thoſe who had once been his moſt vigorous aſſociates, Danton, Fabre d'Eglantine, Bazire, Chabot, Philippeaux, Camille Deſmoulins, Lacroix, Delaunay d'Angers, Herault de Sechelles, who, along with Weſterman, were executed on the evening of the 5th.

391 Preparations for the campaign of 1794, and plan of the allies.

Still, however, the preparations for the enſuing campaign were proceeding with unabated vigour. The committee for military affairs, at the head of which were Carnot, La Fitte, d'Aniſſi, and others, was buſy in arranging along the frontiers the immenſe force which the requiſition had called forth. Plans of attack and defence were made out by this committee; and when approved by the committee of public ſafety they were ſent to the generals to be executed. On the other ſide, the allies were making powerful preparations for another attempt to ſubjugate France. The emperor himſelf took the field at the head of the armies in the Netherlands. The plan of the campaign is ſaid to have been formed by the Auſtrian colonel Mack. Weſt Flanders was to be protected by a ſtrong body of men; the main army was to penetrate to Landrecies, and getting within the line of French frontier towns, it was to cut them off from the interior by covering the country from Maubeuge to the ſea. The plan was *bold*. It belongs to military men to judge whether this was not its only merit. When attempting to put it into execution, the allies muſt have been ill informed of the immenſe force which the French were collecting againſt them. Even the town of Liſle alone, which was capable of containing a numerous army within its walls, and which was to be left in their rear, ſhould have ſeemed an inſurmountable objection to the plan.

392 State of the allied armies.

On the 16th of April the Auſtrian, Britiſh, and Dutch armies aſſembled on the heights above Cateau, and were reviewed by the emperor. On the following day they advanced in eight columns againſt the French, drove in their whole poſts, and penetrated beyond Landrecies; which place the French attempted to relieve, but without ſucceſs. The allied army now amounted to 187,000 men, who were diſpoſed in the following manner; 15,000 Dutch and 15,000 Auſtrians, under the prince of Orange and General Latour, formed the

France. 1794. siege of Landrecies; 15,000 British, and 15,000 Austrians, commanded by the duke of York and General Otto, encamped towards Cambray. The emperor and the prince of Saxe-Cobourg, at the head of 60,000 Austrians, were advanced as far as Guise; 12,000 Hessians and Austrians under General Worms were stationed near Douay and Bouchain; Count Kaunitz with 15,000 Austrians defended the Sambre and the quarter near Maubeuge; and, lastly, General Clairfait, with 40,000 Austrians and Hanoverians, protected Flanders from Tournay to the sea; 60,000 Prussians, for whom a subsidy had been paid by Great Britain, were expected in addition to these, but they never arrived.

The French now commenced their active operations. On the morning of the 26th of April they attacked the duke of York near Cateau in great force. After a severe conflict they were repulsed, and their general Chapuy was taken prisoner. At the same time they attacked the troops under his Imperial majesty, but were there also repulsed in a similar manner; losing in all 57 pieces of cannon. On the same day, however, General Pichegru advanced from Lille, attacked and defeated General Clairfait, took 32 pieces of cannon; and, in the course of a few days, made himself master of Vervic, Menin, and Courtray. On the 29th of April, the garrison of Landrecies surrendered to the allies. When this event was known in the convention, it excited a considerable degree of alarm. It was, however, the last effectual piece of success enjoyed by the allies during this disastrous campaign. General Clairfait was again completely defeated by Pichegru in a general engagement; and it was found necessary to send the duke of York to his assistance. This movement was no doubt unavoidable; but the effect of it was, that it split down the allied army into a variety of portions, capable of carrying on a desultory warfare, but unfit for the vigorous objects of conquest. On the 10th of May the duke of York was attacked near Tournay by a body of the enemy, whom he repulsed; but he was unable to join Clairfait, upon whose destruction the French were chiefly bent: for at the same time that the duke of York was occupied by the attack upon himself, Pichegru fell upon Clairfait with such irresistible impetuosity, that he was compelled to retreat in confusion, and a part of his army appears to have fled to the neighbourhood of Bruges. While Pichegru was thus advancing successfully in West Flanders, General Jourdan advanced in East Flanders from Maubeuge, crossed the Sambre, and forced General Kaunitz to retreat. On the 18th, however, General Kaunitz succeeded in repulsing the enemy in his turn, and they re-crossed the Sambre with considerable loss.

393 Fall of Landrecies.

394 Success of Pichegru in West Flanders.

The allies now found that no progress could be made France while General Pichegru was advancing successfully and occupying West Flanders in their rear. The emperor, therefore, withdrew the greater part of his army to the neighbourhood of Tournay, and resolved to make a grand effort to cut off the communication between Courtray and Lisle, thus to prevent completely the retreat of Pichegru. On the night of the 16th, the army moved forwards in five columns for this purpose. Clairfait was at the same time directed to cross the Lys, to effect a general junction, if possible, and complete the plan. The attempt during that evening seemed to promise success; but, in the course of next day, the division under the duke of York was overpowered by numbers and defeated. The progress of the rest of the columns was stopped, and Clairfait completely defeated. In the confusion of the day, when attempting to rally the different parts of the division which he commanded, the duke of York was separated from his own troops by a party of the enemy's cavalry, and only escaped being made prisoner by the swiftness of his horse. The plan of the allies being thus frustrated, their army withdrew to the neighbourhood of Tournay.

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Pichegru speedily attempted to retaliate against the allies. On the 22d of May he brought down at daybreak his whole force against them. The attack was commenced by a heavy fire of artillery, and all the advanced posts were forced. The engagement soon became general; the attacks were repeatedly renewed on both sides; the whole day was spent in a succession of obstinate battles. All that military skill could do was performed on both sides. The French and the allied soldiers fought with equal courage and equal discipline. At nine o'clock in the evening the French at last reluctantly withdrew from the attack. The day on which a vanquished enemy flies from the field is not always that on which the victory is won. In this engagement the French were unsuccessful in their immediate object; but the weight of their fire, their steady discipline, and their violent obstinacy of attack, raised their military character high in the estimation of the officers and soldiers of the allied army. It was soon perceived, that in addition to these they possessed other advantages. Their numbers were immense; they implicitly obeyed their generals; who, being men newly raised from the rank of subalterns, as implicitly submitted to the directions of the committee of public safety. A combination of efforts was thus produced whose operation was not retarded by divided counsels. On the other side the numbers of the allies were daily declining; their leaders were independent princes or powerful men, whose sentiments and interests were often very hostile to each other, and their exertions were consequently disunited.

On the 24th the French again crossed the Sambre, but were driven back with much loss. On the 27th an attempt was made to besiege Charleroi, but the prince of Orange on the 3d of June compelled them to raise the siege. On the 12th a similar attempt was made, and they were again repulsed. In West Flanders, however, Pichegru was sufficiently strong to commence the siege of Ypres. He was soon attacked by General Clairfait for the purpose of relieving it, but without success. Ypres was garrisoned by 7000 men; reinforcements were therefore daily sent from the grand army to Clairfait for the purpose of relieving it. It is unnecessary to mention the bloody contests in which that unfortunate general was daily engaged with the French. It is sufficient to say, that they were uniformly unsuccessful, and were the means of wasting, in a great degree, the armies of the allies. Ypres held out till the 17th of June, when it capitulated: and such was the discipline of the French army at this time, that no notice could be obtained, for several days, of that event. But in consequence of this and of other events, the duke of York found it necessary to retreat to Oudenarde; for Jourdan, after storming the Austrian camp

395 He lays siege to Ypres, and

396 takes it.

France. 1794.

of Betignies, now advanced with ſuch ſtrength upon Charleroi in the eaſt that its immediate fall was feared. As this would have enabled the two French armies to encircle the whole of Flanders, the prince of Cobourg advanced to its relief. Charleroi ſurrendered at diſcretion on the 25th. This circumſtance was not known by the prince of Cobourg when he advanced on the 26th to attack in their entrenchments the army that covered the ſiege near Fleurus: but the covering army being by this time reinforced by the acceſſion of the beſieging army, the allies were repulſed. Jourdan then drew his men out of their entrenchments; and, in his turn, attacked the Auſtrians. He was three times repulſed, but was at laſt ſucceſsful: the loſs of the vanquiſhed army is ſaid to have been prodigious; but no regular accounts of it have been publiſhed. The French unqueſtionably exaggerated their own ſucceſs, when they ſaid that it amounted to 15,000 men.

397 Charleroi ſurrendered, and the Auſtrians defeated.

398 Further ſucceſſes of the French in Flanders.

The allies now retreated in all quarters. Nieuport, Oſtend, and Bruges, were taken; and Tournay, Mons, Oudenarde, and Bruſſels, opened their gates. At this laſt place, the French armies of Eaſt and Weſt Flanders united. Landrecies, Valenciennes, Condé, and Queſnoi, were fruitleſsly left with garriſons in them. The allied troops, evacuating Namur, formed a line from Antwerp to Liege to protect the country behind. The French advanced in full force, and attacked General Clairfait, cut to pieces half the troops that now remained under him, and broke the line. The allies retreated before them. The duke of York was joined by ſome troops under the earl of Moira that with much difficulty had made their way to him from Oſtend; and with theſe and the Dutch troops he retired to the neighbourhood of Bergen-op-zoom and Breda for the protection of Holland. The prince of Cobourg evacuated Liege, croſſed the Maeſe, and placed a garriſon in Maeſtricht. He ſoon, however, ſent back a part of his troops to the neighbourhood of Tongres; for here, to the aſtoniſhment of all Europe, the French armies made a voluntary pauſe in their career of victory, and ceaſed to purſue their retiring foes. Sluys in Dutch Flanders was the only foreign poſt that they continued to attack, and it ſurrendered after a ſiege of 21 days.

399 And on the Rhine.

On the Rhine the war was equally ſucceſsful on the part of the French. On the 12th, 13th, and 14th of July, repeated battles were fought; in which the French enjoyed their uſual ſucceſs. They had numerous armies in every quarter. Their mode of fighting was to make full preparation for accompliſhing their object, and to fight in great bodies day after day till it was obtained. The Palatinate was then overrun, and Treves taken, by General Michaud. Flanders and the Palatinate have always been accounted the granaries of Germany; and both of them, at the commencement of the harveſt, now fell into the hands of the French.

400 Corſica ſubdued by Great Britain.

During the courſe of this ſummer Corſica was ſubdued by Great Britain; and the whole of the French Weſt India iſlands, excepting a part of Guadaloupe, yielded to the Britiſh troops under the command of Sir Charles Grey and Sir John Jarvis. On the firſt of June the Britiſh fleet, under the command of Earl Howe, gained a moſt ſplendid victory over the French fleet to the weſtward of Uſhant. The French committee of ſafety were known to have purchaſed in America immenſe quantities of grain and other ſtores. Theſe were embarked on board 160 ſail of merchantmen, convoyed by ſix ſail of the line. Lord Howe failed to intercept this valuable convoy. The French fleet failed at the ſame time to protect it. On the morning of the 28th of May the fleets came in ſight of each other. The Britiſh admiral had previouſly deſpatched ſix ſhips of the line under Admiral Montague to intercept the French convoy, while he ſhould engage and detain the grand fleet. The French diſpatched eight ſail to defeat this attempt. In the courſe of the 29th Lord Howe got to windward of the French fleet. His force was 25, and theirs was 26, ſail of the line. The following day he bore down upon them, and broke their line. The engagement was one of the ſevereſt ever fought. The French admiral, in leſs than an hour after the cloſe action commenced in the centre, crowded off with 12 of his ſhips. The Britiſh fleet was ſo much diſabled, or ſeparated, that ſeveral of the French diſmantled ſhips got away under ſails raiſed on the ſtump of their fore-maſts. Seven ſail of the line, however, remained in poſſeſſion of the Britiſh, and two were unqueſtionably ſunk. In the mean time, Admiral Montague fell in with the French convoy, but it was now guarded by 14 ſail of the line. As he could not encounter ſuch a force, he returned home, and it was ſafely conveyed into port. Thus, by one of thoſe contradictions which ſo often occur in human affairs, the Britiſh fleet was victorious, and the French were left in ſome meaſure maſters of the ſea. As this engagement however teſtified that the Britiſh ſeamen had not loſt their ancient ſuperiority on their own element, the nation regarded the preſent victory as a pledge of its independence, and very general rejoicings took place in conſequence of it.

France. 1794.

401 Splendid victory of the Britiſh fleet under Lord Howe.

402 The horrid executions in Paris continued.

In the mean time, the revolutionary ſyſtem of government in the hands of committees of the convention at Paris, and of committees of the popular ſocieties throughout the country, was arrived at its higheſt perfection, and proceeded without oppoſition in its ſevere and ſanguinary meaſures.

On the 10th of May Madame Elizabeth, ſiſter of the late king, was ſacrificed by it in conſequence of a decree of the revolutionary tribunal. Multitudes of others of every rank and ſex were daily ſacrificed in a ſimilar manner; the rich in particular were the great objects of perſecution, becauſe the confiſcation of their property added to the ſtrength of the ruling powers. But neither were the poor ſafe from the bloody vigilance of this new and ſingular government. By the different executions Robeſpierre had contrived to deſtroy every avowed rival. All the conſtituted authorities conſiſted wholly of perſons nominated with his approbation; and as the committees which conducted the buſineſs of the ſtate were at his diſpoſal, his will was irreſiſtible throughout the republi . He met with no oppoſition in the convention; for that body was no longer the turbulent popular aſſembly which it had once appeared; it was little more than a name employed to give ſome ſort of reſpectability to ſuch ſchemes as were propoſed to it.

403 Immenſe power of Robeſpierre.

Amidſt this accumulation, however, of ſeemingly irreſiſtible authority, Robeſpierre was at the brink of ruin. The whole of the old Girondiſt party was indeed ſubdued and ſilent; but many members of the convention ſtill remained attached to it. The party of the Mountain,

404 Verging to ruin.

France. 1794.

Mountain, by means of whom Robeſpierre had riſen to power, with little ſatisfaction now found themſelves not only diſregarded, but ready at every inſtant to fall a ſacrifice to that ſyſtem of terror which they had contributed to erect. Even the Jacobins themſelves, though neither timid nor cautious in the ſhedding of blood, began to murmur when they ſaw that awful privilege confined excluſively within a few hands, or rather monopolized by an individual. In this ſtate things remained for ſome time; and it appeared how poſſible it is for an individual to govern a great nation even while the whole of that nation is hoſtile to his power. The baniſhment or impriſonment of all foreigners, which had long been rigorouſly practiſed, prevents us from poſſeſſing much accurate information concerning the internal ſtate of France at this period; but it is certain, that one circumſtance in particular tended much to accelerate the fall of Robeſpierre. He had procured a decree to be paſſed, authoriſing the committee of public ſafety to impriſon at its pleaſure, and bring to trial, any member of the convention. All the individuals of that body found themſelves placed by this decree in the hands of a man whoſe ſevere and ſuſpicious temper they well knew. Still, however, they were ſo much ſurrounded by ſpies, that it was difficult to form a party or plan of operations; even the majority of the committee of public ſafety were among the number of the diſcontented, but they

405 Particulars of his fall.

dared not to withſtand their chief. At laſt, on the 25th of July, the convention began to exhibit ſigns of agitation. It was underſtood, that in the courſe of a few days Robeſpierre would ſacrifice a number of the members to his ſuſpicions. On the following day the ſitting of the convention was ſtill more tempeſtuous. In a long ſpeech Robeſpierre defended his own conduct againſt thoſe who had reproached him with aſpiring to the dictatorſhip of France. He attacked the party whom he ſtyled *Moderates*, as wiſhing to overturn the revolutionary government, and to reſtore the feeble ſyſtem of the Briſſotines. The reſult of a long debate was, that Robeſpierre was apparently victorious, and his ſpeech was ordered to be printed. On the 27th the convention appeared ripe for a change: St Juſt, a member of the committee of public ſafety, in attempting to defend Robeſpierre, was repeatedly interrupted; and Billaud Varennes ſtood forward and enumerated the crimes, and proclaimed the tyranny, of Robeſpierre. The ſpeech was received with burſts of applauſe. Robeſpierre in vain attempted to defend himſelf; he was ſilenced by ſhouts of execration from every part of the hall. Tallien ſeconded the former ſpeaker in his accuſation. The ſitting was declared permanent, and a decree of arreſt was paſſed againſt Robeſpierre and a younger brother of his, along with St Juſt, Couthon, and Lebas. Theſe men left the convention, and found ſecurity in the hall of the commune of Paris; where the municipal officers agreed to protect and ſtand by them. The toſin was ſounded; the armed force was under their command; an inſurrection was therefore attempted againſt the convention: but the ſections of Paris refuſed their ſupport. Very few of the troops could be collected, and theſe were not firm; the late tyranny had become odious. The hall of the commune was therefore ſpeedily ſurrounded; and about three o'clock in the morning of the 28th Robeſpierre and his aſſociates were made priſoners. They had been outlawed by the convention on account of their reſiſtance. They were not therefore tried, unleſs for the purpoſe of identifying their perſons; and, in the courſe of that day, they were executed: 60 of the municipal officers were alſo executed for joining in the rebellion; and in this way a ſtorm paſſed over, which at one time threatened to involve the French capital in ruin, and filled all Europe with aſtoniſhment. Thus alſo terminated the career of the moſt extraordinary man that the French revolution had brought forward. His talents were undoubtedly conſiderable, and his ambition knew no bounds, bidding defiance to the ordinary feelings of humanity. Had Dumourier poſſeſſed his coolneſs and caution, or had he poſſeſſed the military talents of Dumourier, the convention would certainly have been overturned, and we ſhould have ſeen a ſecond Cromwell on the throne of his murdered ſovereign.

France. 1794.

406 The ſyſtem of terror gives place to that of moderatiſm.

After the fall of Robeſpierre, the convention exhibited no ſmall change of appearance. Inſtead of that ſilence which formerly prevailed, all was buſtle and noiſe; all accuſed each other. There was no longer any leader, and there was no formed party. The former ſyſtem of terror was declared to be at an end, and a new ſyſtem of *moderatiſm* ſucceeded. This was carried to as great a height as the ſyſtem of terror had formerly been; and all means were taken to render popular the fall of their late tyrant. The committees were organiſed anew, and their members ordered to be frequently changed. The correſpondence between the affiliated Jacobin clubs was prohibited, and at laſt the Jacobin club itſelf was aboliſhed. This laſt event was accompliſhed with eaſe; and that ſociety which had been the great engine of the revolution, was itſelf without reſiſtence overturned. Seventy-one deputies of the Girondiſt party, who had been impriſoned ſince the 31ſt of May 1793, were ſet at liberty. The name of Lyons was reſtored to it. Some of the agents of Robeſpierre were puniſhed, particularly the infamous Carrier, whoſe cruelties in La Vendée we formerly mentioned. Still, however, the convention appeared ſo little united and ſo little decided with regard to objects of the firſt importance, that in all probability they would not have conducted the important ſtruggle againſt the nations of Europe with more ſucceſs than the Girondiſt party had formerly done, if the revolutionary government and the late ſyſtem of terror had not already accumulated in their hands ſuch vaſt reſources, and traced out ſuch a plan of procedure, as rendered it an eaſy matter to preſerve their numerous armies in the train of ſucceſs to which they were now habituated.

407 The French towns ſtrongly garriſoned by the allies ſurrender without reſiſtance.

The allies in their retreat had left ſtrong garriſons in the French towns which had ſurrendered to them. Theſe were Condé, Valenciennes, Queſnoi, and Landrecies. They now ſurrendered to the republican armies with ſo little reſiſtance, that the conduct of the emperor began to be conſidered as ambiguous, and he was ſuſpected of having entered into ſome kind of compromiſe with the French. This idea proved erroneous; and as ſoon as the army which had beſieged theſe towns was able to join the grand army under Pichegru and Jourdan, the operations of the campaign were reſumed after a ſuſpenſion of almoſt two months. The French army divided itſelf into two bodies. One of theſe under Jourdan advanced againſt General Clairfait, who had ſucceeded the prince of Cobourg in the command

France. 1794. 408 Further ſucceſſes of the French.

in the neighbourhood of Maeſtricht. On the 15th of September the French attacked the whole Auſtrian poſts in an extent of five leagues from Liege to Maeſtricht. On that and the following day the loſſes were nearly equal. On the 17th the French with 50 pieces of cannon attacked General Kray in his entrenched camp before Maeſtricht. M. de Kray was already retiring when General Clairfait arrived with a ſtrong reinforcement, and after a ſevere combat the French were once more compelled to retire. On the 18th the French renewed the attack with tenfold fury upon every part of the Auſtrian line, and the whole was compelled to fly to the neighbourhood of Aix-la-Chapelle. General Clairfait now choſe a ſtrong poſition on the banks of the Roer, where he even declared it to be his wiſh that he might be attacked. But by this time the ſpirit of his army was humbled, deſertions became numerous, and the want of diſcipline was extreme. On the firſt of October the French croſſed the Maeſe and the Roer, and attacked the whole Auſtrian poſts from Ruremond down to Juliers. After a bloody engagement, the brave and active, though unfortunate, General Clairfait was compelled haſtily to croſs the Rhine, with the loſs of 10 or 12,000 men. The French general did not attempt to croſs that river, but one detachment of his army took poſſeſſion of Coblentz, while others laid cloſe ſiege to Venlo and Maeſtricht, which ſoon ſurrendered.

409 And their progreſs in the conqueſt of Holland.

The diviſion of the French army, in the mean time, under General Pichegru came down upon Holland, and attacked the allied army under the duke of York between Bois-le-duc and Grave. They forced the advanced poſt of Boxtel. Lieutenant-general Abercromby was ſent to attempt to recover this poſt on the 15th of September, but he found the French in ſuch force that he was obliged to retreat. Indeed the French were diſcovered to be no leſs than 80,000 ſtrong in that neighbourhood. The duke of York was unable to contend againſt a force ſo ſuperior, and retired acroſs the Maeſe with the loſs of ſomewhat leſs than 1500 men. Pichegru immediately laid ſiege to Bois-le-duc. On the 30th of September, Crevecœur was taken, and Bois-le duc ſurrendered in 10 days thereafter. In it 408 French emigrants were taken priſoners; and theſe, as well as 700 that had been taken at Nieuport, 500 at Sluys, and 1100 at Valenciennes, were all put to death, agreeable to the rigorous law formerly made by the convention. The French now followed the duke of York acroſs the Maeſe. Upon this the greater part of the allied army under his royal highneſs croſſed the Rhine and took poſt at Arnheim. The remaining part of the army followed ſoon after, and Nimeguen was occupied by the French on the 7th of November. The duke of Brunſwick was at this time requeſted to take the command of the allied army, to protect Holland, if poſſible. He came to Arnheim for that purpoſe; but after examining the ſtate of things there, he declined the undertaking. The allied troops had now ſo often fled before their victorious and almoſt innumerable enemies, they had ſo often been in want of every neceſſary, and had been received ſo ill by the inhabitants of the countries through which they paſſed, among whom the French cauſe was extremely popular, that they had loſt that regularity of conduct and diſcipline which alone can afford a ſecure proſpect of ſucceſs in military affairs.

France. 1794. 410 Conduct, diſcipline, and ſtate of the French armies.

The French, on the contrary, well received, abounding in every thing, and proud of fighting in a popular cauſe, now acted with much order, and ſubmitted to the ſtricteſt diſcipline. In addition to all theſe advantages, the French leaders had the dexterity to perſuade the world that new and unknown arts were employed to give aid to their cauſe. At this period the *telegraphe* was firſt uſed for conveying intelligence from the frontiers to the capital, and from the capital to the frontiers. (See TELEGRAPH). Balloons were alſo uſed by the French during this campaign to procure knowledge of the poſition of the enemy. An engineer aſcended with the balloon, which was ſuffered to riſe to a great height, but prevented from flying away by a long cord. He made plans of the enemy's encampment; and during an attack he ſent down notice of every hoſtile movement. In the affairs of men, and more eſpecially in military tranſactions, opinion is of more importance than reality. The French ſoldiers confided in their own officers as men poſſeſſed of a kind of omniſcience, while the allied troops, no doubt, beheld with anxiety a new contrivance employed againſt them, whoſe importance would be readily magnified by credulity and ignorance. With all theſe advantages, however, after the capture of Nimeguen, they once more made a halt in their career, and abſtained from the attack of Holland, which now ſeemed almoſt proſtrate before them.

411 Their ſucceſſes in Spain.

While theſe events occurred in the north, the French arms were ſcarcely leſs ſucceſsful on the ſide of Spain. Bellegarde was taken; in the Weſtern Pyrenees, Fontarabia ſurrendered, and alſo St Sebaſtian; the whole kingdom of Spain ſeemed panic ſtruck. That feeble government, with an almoſt impregnable frontier, and the moſt powerful fortreſſes, could make little reſiſtance; and the difficult nature of their country was their only protection. The hiſtory of this war is only a hiſtory of victories on the part of the French. In the Eaſtern Pyrenees, on the 17th November, the French general Dugommier was killed in an engagement, in which his army was ſucceſsful. On the 20th of that month the French again attacked the Spaniards, and routed them by means of the bayonet, without firing a ſingle muſket-ſhot. Tents, baggage, and cannon, for an army of 50,000 men, fell into the hands of the conquerors, along with a great part of the province of Navarre. Towards the end of the year, an army of 40,000 Spaniards, entrenched behind 80 redoubts, the labour of ſix months, ſuffered themſelves to be completely routed; their general Count de la Union was found dead on the field of battle, and the whole Spaniſh artillery was taken. In three days thereafter, the fort Fernando de Figueres, containing a garriſon of 9107 men, ſurrendered, although it mounted 171 pieces of cannon, and poſſeſſed abundance of proviſions. The French continued their conqueſts; Roſas was taken, and the whole province of Catalonia was left at the mercy of the invaders.

412 The conqueſt of Holland completed.

The ſucceſſes of this wonderful campaign were not yet terminated; and the laſt part of them is perhaps the moſt important, although no great effort was neceſſary to its execution. The winter now ſet in with uncommon ſeverity. For ſome years paſt the ſeaſons of Europe had been uncommonly mild; there had been little froſt in winter, and no intenſe heat in ſummer. But during the late ſeaſon the weather had long been remarkably

France. 1795. markably dry till the latter part of harveſt, when there fell a conſiderable, though by no means unuſual, quantity of rain. Towards the end of December a ſevere froſt bound up the whole of the rivers and lakes of Holland. The Waal was frozen over in the beginning of January; a circumſtance which had not occurred for 14 years paſt. Taking advantage of this, the French croſſed that river, and with little oppoſition ſeized the important paſs of Bommell, which at other ſeaſons is ſo ſtrong by its inundations. The allied army had been joined by 17,000 Auſtrians, and had received orders to defend Holland to the laſt. They did ſo, and were ſucceſsful in repulſing the French for ſome days between the Waal and the Leck; but the republican army, amounting to 70,000 men, having at laſt advanced in full force, the allied troops were compelled to retire acroſs the Yſſel into Weſtphalia. In the courſe of their march through this deſert country, in the midſt of ſevere froſt and a deep ſnow, they are ſaid to have ſuffered incredible hardſhips, and to have loſt a very great number of men. The French, in the mean time, advanced rapidly acroſs the country to the Zuyder ſea, to prevent the inhabitants from flying, and carrying off their property. On the 16th of January 1795, a party of horſe, without reſiſtance, took poſſeſſion of Amſterdam. The other towns ſurrendered at diſcretion. In conſequence of an order from the ſtates general, the ſtrong fortreſſes of Bergen-op-zoom, Williamſtadt, Breda, &c. opened their gates to the French. The fleet and the ſhipping were fixed by the intenſe froſt in their ſtations, and fell a prey to the enemy; who thus, with little effort, made a complete conqueſt of this populous and once powerful country. The French were well received by the people at large. The power of the ſtadtholder had been ſupported among them merely by the influence of Pruſſia and England. Through hatred to this office, which had now become odious chiefly to the mercantile ariſtocracy of Holland, they were little attached to their allies, and gave them, during the preſent war, as little ſupport as poſſible. The ſtadtholder and his family now fled to England. The French declared, that they did not mean to make ſubjects but allies of the Dutch, and invited them to call together popular aſſemblies for ſettling their own government, under the protection of the French republic.

Thus terminated a campaign, the moſt aſtoniſhing, perhaps, that has been known in the hiſtory of mankind. In the courſe of it, even before the conqueſt of Holland, the French had taken 2000 pieces of cannon and 60,000 priſoners. After that event, the conquered territories added to them a population of nearly 14 millions of people. Luxembourg and Mentz were the only places on this ſide of the Rhine that reſiſted them. The former was cloſely blockaded, for the purpoſe of compelling it to ſurrender; the latter was ſeveral times aſſaulted, but ſucceſsfully held out.

413 The diet of Ratiſbon reſolve on peace. At this period Europe ſeemed to be weary of ſuch a bloody conteſt, and the Diet of Ratiſbon intimated its reſolution to adopt ſuch meaſures as might tend to bring about a general pacification. A treaty was concluded between the grand duke of Tuſcany and France. The convention declared their readineſs to treat for peace with any of the powers of Europe upon honourable terms. Great Britain and Auſtria, however, ſeemed to be perſuaded, that an honourable and permanent peace could not be obtained with France, while her government was ſubject to ſuch perpetual changes. For inſtance, ſuch was the enmity of the Mountain party againſt the Gironde, that any treaty entered into by the latter would have been trampled upon by the former; and ſuch, it was obſerved, might continue to be the aſpect of affairs in that diſtracted country for an indefinite length of time. France. 1795.

414 A new conſtitution. As the conſtitution which had been framed in the year 1793, during the tyrannical dominion of Robeſpierre was juſtly deemed impracticable, a committee was appointed to frame one entirely new. It was compoſed of Sieyes, Cambaceres, Merlin of Douay, Thibaudau, Mathieu, Le Sage of Eure and Loire, and Latouche. On the report of Cambaceres, the 19th of April, that the committee thought that a commiſſion ſhould be appointed for this important buſineſs, a number of qualified perſons were accordingly choſen, while all citizens were invited to communicate their ſentiments upon the ſubject, and the committee was to give orders for the beſt plans to be publiſhed. The feelings of the nation at large received additional gratification from the conduct of the convention towards Fouquier Tainville the preſident, and 15 judges and jurors, of the revolutionary tribunal. They were fully convicted on the 8th of May, and executed on the 9th, launched into eternity amidſt the juſt execrations of a vaſt multitude of ſpectators.

415 Inſurrection of the Jacobins. Although the Jacobins were defeated on the 1ſt and 2d of April, they did not conſider themſelves as entirely ſubdued. They were plotting a more extenſive inſurrection, which was not to be confined to the capital, and fixed on the 20th of May as the period of revolt. On the morning of that day, the toſin was accordingly ſounded, and drums beat to arms in the ſuburb of St Antoine, in which the Jacobins had always enjoyed the greateſt influence. Upon this the convention met; and although the inſurrection was far from being a ſecret, the committee of public ſafety did not appear to have taken any meaſures to prevent it. It was only at the moment when the inſurgents were approaching that General Hoche was appointed to the command of the armed force, and ſent to collect the military and citizens for the protection of the convention. The hall was preſently ſurrounded, the guards were overpowered, and the mob forced their way into the midſt of the aſſembly. The multitudes of women who met upon this occaſion ſhouted for bread, and the conſtitution of 1793. Vernier the preſident, a man far advanced in years, quitted the chair to Boiſſy d'Anglas, who kept it with commendable fortitude during the remainder of the day. The mob had cockades with this inſcription upon them, "Bread, and the conſtitution of 1793." One of the party attached to the convention imprudently tore off the hat of one of the inſurgents, whom the multitude attacked with ſwords; and as he fled towards the chair of the preſident, he was killed by a muſket ſhot. The majority of the members gradually retired from this ſcene of lawleſs intruſion, and left the multitude maſters of the hall. Four of the members who remained eſpouſed the cauſe of the inſurgents, whoſe triumph, however, was of very ſhort continuance. A large body of the military and the peaceable citizens vanquiſhed them in the evening, the powers of the majority were reſtored, and the four de-

putie

France. 1795.

puties who eſpouſed the cauſe of the mob were arreſted.

416 Mean compliance of the convention.

It would appear that the convention and the citizens of Paris now believed their triumph to be complete, as no meaſures were adopted by them ſufficient to prevent the repetition of a ſimilar outrage. The Jacobins, however, were not yet determined to view their cauſe as deſperate, for next day they collected in the ſuburbs, and in the afternoon made a ſecond attempt. The Carouſal was taken by them without oppoſition, when they pointed ſome pieces of cannon againſt the hall of the convention, the members of which being wholly unprotected, endeavoured to gain over the mob by flattery,—by promiſing them bread, and the conſtitution of 1793, or whatever elſe they thought proper to demand; and the preſident even gave the deputation the fraternal embrace. On the 23d, the citizens aſſembled, and went to the Thuilleries to defend the convention from inſult and violence. The military collected in conſiderable force; and the convention was at length encouraged to act on the offenſive. It was decreed that if the ſuburb of St Antoine did not immediately ſurrender its arms and cannon, with the murderer of Ferrand, it would be declared in a ſtate of rebellion. The generals of the convention received orders to reduce it by force; and the inſurgents finding themſelves unequal to the conflict, were forced by the inhabitants to make an unconditional ſurrender, to preſerve their property from the depredations of the military. The ſoldiers found among the priſoners were put to death, on which occaſion ſix of the members were tried and condemned by a military commiſſion. Three of them were guilty of ſuicide, and the other three were publicly executed.

417 Defeat of the Jacobins.

In the ſouthern parts of France, the Jacobins were equally turbulent as their brethren in Paris, and formed an inſurrection at Toulon on the 20th of May, ſeizing on the gates, upon which they planted cannon; they ſet at liberty ſuch of their aſſociates as had been incarcerated, and detained the fleet which was about to put to ſea. From Toulon they proceeded to Marſeilles, at which time they were 3000 ſtrong, and had 12 pieces of cannon. On their march they were oppoſed by Generals Charton and Pactod, by whom they were defeated, 300 of them being ſent priſoners to Marſeilles, and Toulon was liberated.

418 Hope to be ſucceſsful.

The Mountain party, who were anxious to revive the terrific reign and meaſures of Robeſpierre, were now very much reduced, and expoſed in many places to violent perſecution. Aſſociations were formed for the purpoſe of avenging the crimes they committed during the continuance of their power. When we reflect on the character of Robeſpierre's government and what all ranks of men ſuffered under it, we muſt conſider it truly aſtoniſhing that any number of men ſhould hazard their lives in attempting its reſtoration. The party was of courſe gradually abandoned by its adherents on the fall of its tyrant, and it ſunk in the eſtimation of every one who examined it with attention. Still, however a ſmall party remained, the members of which were men of ſuperior activity and enterpriſe. They conſiſted of ferocious republicans who thought they beheld the revival of royalty and ariſtocracy in every attempt to eſtabliſh a mild, ſober, and regular government. Yet, amidſt the univerſal odium caſt upon them, the Jacobins expected to riſe once more into power; but what is moſt ſingular, the revival of their ſtrength is to be dated from their unſucceſsful inſurrection juſt now mentioned. Their want of popularity began to affect the convention, as the people remembered how tamely that body ſubmitted to the tyranny of Robeſpierre, of whoſe power the majority of the members had been the ſervile inſtruments. The preſs therefore, being now free, the moſt hideous picture of their conduct was held up to the public. The greater part of them now began to repent of their victory over the Jacobins, as they foreſaw that the conſequences in the end might prove fatal to themſelves. France. 1795.

419 New conſtitution.

On the 23d of June, Boiſſy d'Anglas preſented the report of the committee relative to the plan of a new conſtitution. It was, like its predeceſſors, prefaced with a declaration of the rights of man, conſiſting beſides of 14 chapters on the following ſubjects:—the extent of the republican territories, the political ſtate of citizens, primary aſſemblies, electoral aſſemblies, the legiſlature, the judicial authority, the public force, public inſtruction, the finances, foreign treaties, the mode of reviſing the conſtitution, and an act that no rank or ſuperiority ſhould exiſt among citizens, but what might ariſe from the exerciſe of public functions.

420 made up of two aſſemblies.

The legiſlature was compoſed of two aſſemblies, the council of the Ancients, conſiſting of 250 members, as none but married men and widowers turned of 40 could be choſen members of it; the other council conſiſted of 500 members, and enjoyed the excluſive privilege of propoſing the laws, while the council of Ancients might reject or oppoſe, without having power to alter the decrees. The executive power was intruſted to five perſons who were to be 40 years of age at leaſt, and to be denominated the *Executive Directory*. The two councils had the power of electing its members, the council of five hundred propoſing 10 times as many candidates as could be choſen, and the council of two hundred and fifty ſelected the five members from among theſe 50 candidates. One member of the directory was to go annually out of office, by which they were all changed in the courſe of five years. In enacting laws the directory had no vote, being appointed purely to ſuperintend the execution of them, regulated the coining of money, and had the diſpoſal of the armed force. The treaties made by the directory with foreign courts were not binding without the ſanction of the legiſlature, and war could not be made without a decree of the two aſſemblies. The whole articles of the new conſtitution underwent a ſeparate diſcuſſion, when they were to be tranſmitted to the primary aſſemblies for their approbation. Prior to this event, however, it was agreed on by a majority of the convention, in order to avert the danger which now threatened themſelves, from the loſs of public favour, that at the approaching general election, the electors ſhould be bound to return two-thirds of the preſent members, and if this failed, that the convention themſelves might fill up the vacancies. Theſe decrees accompanied the conſtitution; but at Paris the idea of re-electing two-thirds of the old members was rejected with contempt, and the abſurdity of it pointed out with every expreſſion of acrimony.

421 Freedom abridged by the convention.

The convention in the mean time did not fail to publiſh the approbation of the decrees by the primary aſſemblies, as well as of the conſtitution, although it is certain

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certain that vaſt numbers had confounded the two together, and given their approbation accordingly. Such was the rage of many againſt the convention in conſequence of the decrees already mentioned, that it was even propoſed to try the whole members before a new revolutionary tribunal, and puniſh each in proportion to his crimes. The ſections remonſtrated againſt the decrees to the convention, and the more eager they appeared in the buſineſs, the more perſuaded was the convention of its own imminent danger. Every remonſtrance, however, was diſregarded, and the contending parties formed the reſolution of ſettling it by force of arms. About 100 electors of Paris met in the hall of the theatre in the ſuburb of St Germain before the day of meeting which had been appointed by the convention, and having choſen De Nivernois for their preſident began their debates, abſurdly concluding that the ſovereignty was veſted in the hands of the electors, after theſe had been choſen by the primary ſections. A body of troops was ſent to diſſolve them as an illegal aſſembly, which was accompliſhed without any difficulty, the citizens not having been unanimous in their ſentiments reſpecting it.

422 Jacobins ſurted by he conven- ion.

This, however, did not prevent the ſections from preſuming that by ſteady perſeverance they would be finally victorious, having always found that the party favoured by the co-operation of the Pariſian populace, had carried their point ever ſince the commencement of the revolution. The armed force with which the convention was ſurrounded gave the people very little alarm, as they endeavoured to perſuade themſelves that the military could never be brought to act againſt the citizens. As the members of the convention alſo appeared to ſuſpect their fidelity, they applied for aſſiſtance to thoſe very Jacobins whom they had humbled on the 24th of May. If the ſections of Paris deteſted the members for their connexion with the atrocities of Robeſpierre, the Jacobins admired them from this very circumſtance; a ſet of reſtleſs, bloody men, who were never ſatisfied with wars abroad nor revolutions at home. Hundreds of them were releaſed from priſon, and put in a ſtate of requiſition for aſſiſting the legiſlative body.

423 ruggle tween e conven- on and rifians.

The ſections of Paris having beheld the convention ſurrounded by men who had juſtly obtained the appellations of *terroriſts* and *men of blood*, they exhibited a deſire of engaging them which was altogether unbounded. Their leader deſigned to make the members priſoners, till they could be conveniently brought to trial, and in the interim conduct public affairs by committees of the ſections, till a new legiſlative body could be choſen. General Miranda was to have the command of the armed force after the overthrow of the convention, but as it was ſtill problematical which party would be triumphant, he retired to the country till the event ſhould declare it, reſolving to ſhare the reward of a conqueſt to which he was to contribute nothing. The ſuperior officers of the convention were unfaithful, yet the ſubalterns and ſoldiers might have continued firm, to which they would, no doubt, be ſtrongly exhorted by their Jacobin auxiliaries. What was greatly in favour of the convention was, that the firſt moments of enthuſiaſm were permitted to paſs away, after which the ſections exhibited a conduct both undecided and weak.

Barras was appointed on the 4th of October by the convention to the command of the troops, Generals Menon, Raffet and ſome others, having been diſmiſſed from office. Barras called in the aid of the moſt able officers, among whom we find Brune and Bonaparte, and made ſpeedy preparations for a vigorous defence. Troops with cannon were placed in every avenue leading to the Thuilleries, and maſked batteries were placed in ſituations of a more retired nature, if any of theſe ſhould happen to be forced. The precaution was alſo taken of tranſporting the proviſions and military ſtores to St Cloud, if the convention ſhould be obliged to retreat from Paris. On the 5th of October both parties continued on the defenſive for ſeveral hours, but about three o'clock in the afternoon, overtures were made by the general of the inſurgents, Danican, in which he declared that the intention of the citizens was for peace, only they apprehended a maſſacre was to be begun by the armed terroriſts ſurrounding the convention, and that if theſe were removed they would return to their duty; but it was reſolved to try the iſſue of the diſpute at the point of the ſword, as the Jacobin party in the convention were now more fully perſuaded of ultimate ſucceſs. On this occaſion the armed Jacobins without are generally underſtood to have been the firſt aggreſſors. The citizens on the ſouth ſide of the river made an effort to reach the convention by the Quay de Voltaire, but were completely prevented by the cannon of the convention, while the conflict was extremely obſtinate on the other ſide of the river, near the convention. After an engagement of four hours continuance, the ſections were repulſed, and driven to the poſt of St Roche, which being alſo taken after an obſtinate reſiſtance, the inſurgents fled to their head quarters at the ſection of Pelletier; but the troops of the convention were, about midnight, in poſſeſſion of the whole city.

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424 Barras appointed to the chief command of the national troops.

425 The violent Jacobins again take the lead.

The victors attributed this inſurrection to the influence of the royaliſts; and whether they were right in their judgment or not, it is certain that the cauſe of royalty was now become leſs odious to the people in general than the bloody extravagance of republicaniſm; but the mob in fact ſeem to have looked no farther than the diſarming of the Jacobins, and obtaining new repreſentatives. The attempt failed, and the Mountain were again at the head of the ſtate. The ſittings of the convention were terminated on the 27th of October, and was ſucceeded by the new legiſlature in terms of the conſtitution. Among its laſt decrees, was one granting a general amneſty for all crimes and proceedings of a revolutionary nature, but the emigrants, tranſported prieſts, and every one concerned in the laſt inſurrection, were excluded from the benefit of it. The agents of Robeſpierre in Paris and the departments were liberated from priſon, and promoted to lucrative offices under the new government.

426 Meaſures of the new legiſlature.

The next ſtep of the new legiſlature was to divide itſelf into two councils, and proceed to the election of an executive directory. The council of five hundred was bound to preſent to the other council 50 candidates, of which a liſt was accordingly made out, conſiſting of no more than five whom they wiſhed to be choſen, the other 45 conſiſting of obſcure perſons, farmers and peaſants, which left no more power to the council of ancients than the form of an election, which

muſt

France. 1795. must fall on Sieyes, Barras, Rewbell, La Reveillere Lepaux, and Letourneur de la Manche, none of the reſt being qualified for the office. The intriguing Sieyes, however, did not deem it prudent to venture on the poſſeſſion of power; and on his declining to accept of this new dignity, Carnot was appointed in his ſtead. The form of government now eſtabliſhed did not promiſe to be productive of much happineſs or tranquillity, as the moſt important offices in the ſtate were filled by men whom the people could not endure. The members too of the executive directory, except only Reveillere Lepaux, had always been connected with the Mountain party, and they employed the Jacobins in almoſt every official department, which could not fail to render the government peculiarly obnoxious. It was feared that a directory choſen by the Jacobins, and new legiſlators appointed by the people, might one day be the means of totally ſubverting the conſtitution, which actually took place.

427 Treaty of peace with Pruſſia. On the 10th of April a treaty of peace with the king of Pruſſia was preſented to the convention, in order to be ratified. By virtue of this treaty, it was agreed that the republican troops ſhould be immediately withdrawn from the territories of Pruſſia on the right bank of the Rhine, having power to retain, till a general peace, the territories which France then poſſeſſed on the left bank of that river. There was to be a mutual exchange of priſoners of war, and the intercourſe between the two countries was to be placed in its former ſituation. Meaſures were alſo adopted to ſhift the theatre of hoſtilities from the northern parts of Germany. At the ſame time the king of Sweden acknowledged the French republic, whoſe ambaſſador was received at Paris with great ſolemnity. Another treaty was concluded with Pruſſia in the month of May, which had a ſpecial reference to the line of neutrality. The cantons of Switzerland followed the example of the king of Sweden, and a treaty of peace was concluded at Baſle on the 22d of July, between the republic and the court of Spain, in conſequence of which France gave up all the conqueſts ſhe had made in that country, and the original frontier was reſtored; in return for which the republic received all the Spaniſh part of St Domingo. In this treaty the Dutch republic was included, and the mediation of the king of Spain, in favour of Portugal and the Italian princes, was accepted by France.

428 Death of Louis XVII. On the 9th of June, the dauphin, the heir to the throne of the unfortunate Louis XVI. and his only ſon, died in the priſon of the Temple, where he was confined with his ſiſter ſince the death of the king. Some think that his death was the conſequence of diſeaſe, although it is much more probable that he was poiſoned, ſince there is no crime in the annals of human depravity which the French rulers would have trembled to perpetrate, of which the numerous murders already detailed afford indubitable evidence. His death, however, intereſted the French nation ſo deeply in favour of his barbarouſly uſed family, that the convention found it prudent to liberate the princeſs. The committee of public ſafety propoſed to the emperor to give her up in exchange for the commiſſioners whom Dumourier had ſent priſoners to the Auſtrians, together with Semonville and Marat, who were ſeized on their way to Turkey as envoys extraordinary from the French republic. The propoſal was agreed to, and the exchange took place at Baſle in Switzerland. France. 1795.

If Britain was unfortunate in her affairs on the continent, ſhe ſtill retained her ſuperiority on the watery element. A fleet under Admiral Hotham engaged a French fleet on the 14th of March, and took two ſail of the line, the Ca Ira and Cenſeur; but this was nearly counterbalanced by the loſs of the Berwick and Illuſtrious. Three French ſhips of the line were captured by Lord Bridport on the 23d of June, in an attack on the enemy's fleet off Port L'Orient, the reſt of the fleet effecting its eſcape. As Britain thus evinced upon all occaſions her ſuperiority by ſea, advantage was taken of this circumſtance to ſend aſſiſtance to the royaliſts in the weſtern departments, which unfortunately for them came too late, for the convention had offered them a treaty which was accepted and ſigned at Nantz on the 3d of March, on the one part by deputies from the convention, and on the other by Charette, Sapineau, and other chiefs of the inſurgents of La Vendée, and by Cormartin, as repreſentatives of the party called *Chouans* or *night owls*. Stofflet ſubmitted to the republic on the 20th of April. The countenance given by Britain to the royaliſts made them diſregard theſe treaties. The troops ſent to their aid were compoſed of emigrants in the pay of Great Britain, and a number of priſoners who agreed to join the royal cauſe. Puiſaye commanded this motley army, and Count de Sombreuil afterwards joined him with an inconſiderable reinforcement. This expedition arrived in the bay of Quiberon on the 25th of June. Arms were put into the hands of the inhabitants of the country, but it was ſoon found that they could not be of much advantage to regular troops. A reſolution was therefore adopted to withdraw the emigrant army within the peninſula of Quiberon, the fort of which name was taken on the 3d of July, the garriſon of which conſiſted of about 600 men, and was afterwards occupied by the emigrants. All the poſts without the peninſula were carried by an army under General Hoche, the emigrants and Chouans eſcaping into the boats of the Britiſh fleet, or flying for protection under the cannon of Quiberon fort. The republicans then began to erect formidable works on the heights of St Barbe, which commanded the entrance of the peninſula. To prevent theſe operations, a ſally on the 7th was made from the fort, but without effect, and another with ſtill greater force had no better ſucceſs. The whole forces in the peninſula amounted, including Chouans, to about 12,000 men, 5000 of whom were ſent to make an attack on the heights of St Barbe, where the republicans were entrenched in three camps, two of which were taken without difficulty; but as the emigrants ruſhed forward to attack the third, a maſked battery was opened upon them with grape ſhot, in conſequence of which a dreadful ſlaughter enſued, and very few of the emigrants would have effected their eſcape, had not the fire from the Britiſh ſhips compelled the republicans to abandon the purſuit. 1795. 429 Britain ſuperior by ſea.

430 Failure of the Quiberon expedition. It was now evident that a complete and ultimate failure would be the fate of this expedition, and deſertion among the emigrants became very frequent, eſpecially thoſe who had been liberated from priſon on condition of ſerving againſt the republic. The weather was very tempeſtuous on the evening of the 20th, which induced the emigrants to indulge in a fatal ſecurity. The troops of

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431 Continental affairs. But to return to the affairs on the continent. The fort of Luxembourg ſurrendered on the 7th of June, after having been beſieged ſince the preceding campaign, which put the French in poſſeſſion of the whole left bank of the Rhine, Mentz only excepted, becauſe the Auſtrians could conveniently ſupply it with every neceſſary from the oppoſite bank of the river. The republicans therefore determined to croſs the river, to inveſt it on every ſide; but for ſome time the attempt was delayed, till the reſult of the Quiberon expedition ſhould be fully known. The paſſage of the Rhine at Duſſeldorf was effected by General Jourdan in the month of Auguſt, as commander of what was denominated the army of the Sambre and Meuſe. Having driven three Auſtrian poſts before him, he croſſed the Maine, and inveſted Mentz and Caſſel, and Pichegru at the ſame time took poſſeſſion of Manheim, having croſſed the river near that city with the army of the Rhine and Moſelle. A ſtrong detachment of this army having driven Marſhal Wurmſer from an important poſt, began to plunder, and conſequently run into confuſion, of which the Auſtrians took a proper advantage, returned to the charge, and the republicans were vanquiſhed. Jourdan was purſued by Clairfait to Duſſeldorf, where the former general made a ſtand, and Pichegru recroſſed the Rhine near Manheim, leaving a garriſon in that city of 8000 men, which, after a vigorous ſiege, ſurrendered to the Auſtrians; and the republicans were driven from the vicinity of Mentz. Little more was either loſt or won by the contending parties at this time, and they mutually agreed to an armiſtice of three months.

432 Treaty with German princes. The landgrave of Heſſe Caſſel entered into a treaty of peace with France on the 28th of Auguſt, which was agreed to, on condition that he would furniſh Britain with no more troops during the war. Peace upon ſimilar terms was granted to the elector of Hanover; and the duke of Wirtemberg and ſome other princes of the German empire began to treat; but the negociations were broken off in conſequence of the reverſe of fortune which the French now experienced.

433 Abſurd conduct of the directory, The directory, however, ſtill reſolved to proſecute the war with vigour, and therefore made vaſt preparations during the winter for another campaign. The Mountain party being again poſſeſſed of power, ſoon began to diſcover their reſtleſs, turbulent diſpoſition, which could not long ſubmit peaceably to any government whatever, and became diſguſted with that very directory which they themſelves had eſtabliſhed. They were perpetually diſturbing the public tranquillity. The people of Paris, after the 5th of October, durſt not openly avow their abhorrence of the Jacobins, but it was underſtood that their wearing green cravats was a token of contempt. This piece of dreſs was prohibited by the directory as a mark of attachment to royalty. Of this they were ſoon aſhamed, and recalled their edict in a few weeks. In the ſouthern parts of France, the preſent authority of the Jacobins produced very ſerious effects. Freron, by whom they had been abandoned after the death of Robeſpierre, returned to their cauſe before the 5th of October, and was ſent to Toulon with full powers of adminiſtration. He diſmiſſed the municipality which had been choſen by the people, reſtored the Jacobin clubs, and every perſon whom he ſuſpected he cauſed to be impriſoned. The directory was alarmed at the numerous complaints which were made from every quarter againſt the conduct of thoſe turbulent and bloody men, and reſolved to obtain the confidence and affections of the people by deſerting them entirely. Freron was recalled from Toulon, and more moderate men were made choice of to ſucceed the reſtleſs, ſanguinary Jacobins.

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434 which takes meaſures againſt the Jacobins. The directory alſo made a public declaration that its confidence had been abuſed. The police miniſter was charged with the removal from Paris of the members of former revolutionary tribunals, and ſuch as were active leaders of the Jacobins. Ten thouſand men, called the *legion of police*, who acted againſt the Pariſians on the 5th of October, and were decidedly the favourers of the Jacobins, received orders from the directory and legiſlative body to join the armies on the frontiers, which orders they refuſed to obey, but were compelled to ſubmit by the interference of other troops brought from a diſtant quarter to provide againſt that event. This led the violent Jacobins to concert a plan for the ruin of the directory and the majority of the councils, who had now abandoned them. But as they were a conſiderable time in being ready for action, their deſigns were diſcovered and completely defeated. The guards were increaſed on the 10th of May, and bodies of cavalry were ſtationed round the Luxembourg and Thuilleries. The council of five hundred was informed by the directory, that a terrible plot was ready to burſt forth on the enſuing morning. The conſpirators at the ringing of the morning bell, were to proceed in ſmall parties of three or four men each, to the houſes of thoſe perſons whom they had fingled out for deſtruction. Having murdered theſe, they were then to unite in one body againſt the directory, whoſe guard they conceived themſelves qualified to vanquiſh. The Jacobins in the mean time had nominated a new directory and legiſlature, from among the moſt turbulent and abandoned of their own perſuaſion. Some of the leaders of this conſpiracy were arreſted, among whom was Drouet the poſtmaſter of Varennes, who ſtopped the unfortunate Louis on his way to the frontiers, and with him ten others, who were condemned at Vendome, but Drouet made his eſcape.

435 Moderate arty. Theſe defeats which the Jacobins experienced, and the diſgrace into which they were again brought, determined the moderate party in the two councils to attempt to procure the repeal of the concluding decrees of the convention, which had granted them an amneſty, and confirmed the laws againſt emigrants, excluding their friends from ſucceeding them. A number of days were employed in the diſcuſſion of theſe topics, but the moderate party gained nothing in favour of the emigrants, and nothing againſt the Jacobins but this, that ſuch as owed their preſervation to the amneſty, ſhould

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should not be deemed competent to hold any public offices.

436 Deplorable state of the finances.

Another matter of no less a serious nature now called for the attention of the republican government, which was the deplorable state of the finances. While the tyrannical usurpation of Robespierre continued, terror supported the credit of the assignats, which joined to the sale of the church lands, and the property of the emigrants, furnished ample resources in the mean time; and no provision was at all thought of for future exigencies. If money was wanted, more assignats were fabricated, and no enquiry was made concerning the public expenditure, as no taxes were demanded from the people. The directory complained to the councils of the great distress under which they laboured, and of the want of sufficient funds to meet the unavoidable expences of the ensuing campaign. A law was in consequence passed on the 25th of March, giving authority to dispose of the remainder of the church lands at the value formerly fixed on them, which was 22 years purchase. A new paper currency, termed *mandats*, was to be received in payment, but government had now lost its credit. These rapidly lost a great part of their value, which increased the demand for national property; and to prevent this, the legislature decreed that one-fourth of every purchase should be paid in cash, which prevented the sale of the national property, and the circulation of *mandats*.

437 National institute established.

During their preparations for the approaching campaign, the directory attempted to render themselves popular at home, by the establishment of the *National Institute*, or society of men of letters under the protection of government. Every man of erudition who had escaped the bloody persecution of the Mountain party, was invited to be a member. It was opened on the 4th of April, in the hall of the Louvre, when the ambassadors of Spain, Prussia, Sweden, Denmark, Holland, America, Tuscany, Genoa, and Geneva, were present, and the members of the directory in their robes of state. The president expressed the determination of the executive power to afford every encouragement to the improvement of literature and the arts; and the president of the institute replied that it was the determination of the members to endeavour to give lustre to the republican government by the exercise of their talents, and by publications. The speeches were enthusiastically applauded by 1500 spectators, and the general expectation was, that France was now to enter on a career of glory and prosperity wholly unprecedented.

438 Proposal of peace by Britain.

About this time an approach towards a negotiation with France was made on the part of Great Britain, by Mr Wickham, ambassador to the Swiss Cantons; and on the 8th of March, a note was communicated to M. Barthelemy, ambassador from the French republic. It was asked, whether France would be willing to send ministers to a congress to negotiate peace with his Britannic majesty and his allies? Whether France would be inclined to communicate the general grounds on which she would be willing to conclude peace, that his majesty and his allies might consider them in concert? Lastly, whether France would desire to communicate any other mode of accomplishing a peace? Whatever answer should be returned was to be transmitted to the British court; but it was at the same time declared that Mr Wickham had no authority to discuss these subjects. An answer was returned on the 26th of the same month, by Barthelemy in the name of the directory, complaining of the insincerity of the British court, as its ambassador had no authority to negotiate, and that the proposal of a congress made negotiation endless. It stated the wish of the directory to obtain peace, but that no portion of territory would be relinquished, which formed part of the republic by the constitutional decree. To this note no reply was made; but it was complained of to the foreign ministers resident at the court of London, and considered as leaving Britain no other alternative than the prosecution of the war, at once both just and necessary.

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439 Royalists in the west subdued.

During the winter season, the directory found means to reduce the western departments to proper subjection. The expedition from England had tempted the royalists once more to try their fortune in the field of battle; but after a number of defeats, their leaders Charette and Stofflet were apprehended, and put to death on the 29th of March, which tended to suppress the insurgents in every quarter. Domestic enemies being thus subdued, the republican government was enabled to make the more vigorous exertions on the frontiers. Their military force was divided into three armies; the army of the Sambre and Meuse under Jourdan was principally stationed about Dusseldorf and Coblentz; the army of the Rhine and Moselle, commanded by the celebrated General Moreau, stationed on the Upper Rhine, and from Landau to Treves; and the third army occupied the Italian coast from Nice towards Genoa, the command of which was bestowed on Bonaparte, a native of Corsica, and one of the most extraordinary men that ever lived in any country, as our readers will perceive in the sequel.

440 Bonaparte takes the command of the army of Italy.

The army of Italy about this time was 56,000 strong, which Bonaparte, at his arrival, found very ill equipped, and in a state of mutiny for want of pay and necessaries. Wishing them to prepare for immediate action, he addressed them in the following manner: "If we are to be vanquished, we have already too much, and if we conquer, we shall want nothing." He was anticipated by the enemy. The Austrians employed in the defence of Italy under Beaulieu were more numerous than the army of Bonaparte, to which were added 60,000 regular troops belonging to his Sardinian majesty, the militia of the country, and about 2500 Neapolitan cavalry. On the 9th of April the campaign was opened by General Beaulieu, who attacked a post called *Voltri*, in the possession of the republicans, six leagues from Genoa. They defended themselves till the evening, after which they retreated to Savona. Next day Beaulieu succeeded in all his attempts, till he reached Montenotte, the last republican entrenchment, which contained 1500 men. Rampon, their commander, prevailed with them in a moment of enthusiasm, to swear that they would not surrender, in consequence of which they succeeded in arresting the progress of the Austrian general for the remaining part of the day. The right wing of the French army was, during the night, stationed in the rear of the redoubt of Montenotte, under La Harpe, while Bonaparte, Massena, Berthier and Salicetti, advanced by Altara, to take the enemy on their flank and rear. Powerful reinforcements were in the mean time sent to Beaulieu, who, on the morning of the 11th again made an attack on La Harpe; but the approach of Massena soon made the Austrians and Sardinians

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nians give way on all ſides. Two of their generals were wounded, 2500 were made priſoners, and the republicans purſued them beyond Cairo, which, on the following day, fell into their hands.

441 Defiles of Milleſimo forced by Angereau.

General Angereau, on the 13th, forced the defiles of Milleſimo; and by a rapid movement General Provera was ſurrounded at the head of 1500 grenadiers; but inſtead of ſurrendering, this brave officer forced his way through the enemy, and entrenched himſelf in the ruins of an old caſtle at the top of the hill. Angereau, with his artillery, endeavoured to diſlodge him; after which he arranged his troops into four columns, and made an attempt to carry Provera's entrenchments by ſtorm, which proved unſucceſsful, but the French had two generals killed, and Joubert was wounded. The adverſe armies faced each other on the 14th, while a diviſion was left to continue the blockade of Provera. The Auſtrians made an unſucceſsful attack on the republican centre, while Maſſena turned the left flank of their left wing in the vicinity of Dego, and La Harpe turned the right flank of the ſame wing. One column kept in check the centre of the Auſtrians, another attacked the flank of their left wing, and a third column gained its rear. The republicans took 8000 priſoners, and General Provera at laſt ſurrendered.

442 Dego retaken by Bonaparte.

General Beaulieu, after he was defeated at Milleſimo, made an effort ſimilar to thoſe which have been frequently found to change the fortune of war. With 7000 of his beſt troops he made an attack upon the village of Dego, where the republicans after their ſucceſs were indulging in ſecurity. He made himſelf maſter of the village, and the troops having rallied under Maſſena, that general employed the greater part of the day in his efforts to retake it. The republicans were three times repulſed, but Bonaparte having arrived in the evening with reinforcements, the poſt was retaken, and 1400 men were made priſoners. Bonaparte was now, by deſign, between the Auſtrian and Sardinian armies, his right wing being ſecured by the village of Dego againſt the efforts of Beaulieu, while he could act againſt the Piedmonteſe troops with the greater part of his force. Angereau powerfully ſeconded his exertions, who had opened a communication with the Tanaro, where Serrurier was approaching the town of Ceva, in the vicinity of which there was a Piedmonteſe entrenched camp of 8000 men. The redoubts covering this camp were, on the 16th, attacked by General Angereau, capturing the greater part of them, on which the Piedmonteſe evacuated Ceva during the night, and, on the 17th, Serrurier entered it in triumph. Count Colli repulſed Serrurier on the 20th; but Bonaparte, on the 22d, defeated him at Mondovi. The flying army endeavoured to make a ſtand at Foſſano, its wings being at Coni and Cheraſci, which latter place was taken by Maſſena on the 25th, when Foſſano was taken by Serrurier, and Alba by Angereau.

443 Armiſtice with Sardinia.

Prior to theſe movements, an armiſtice was requeſted by Count Colli on the 23d, which General Bonaparte granted, on condition that the fortreſſes of Coni, Ceva, and Tortona, ſhould be given up to him, with their magazines and artillery, and that he ſhould have permiſſion to croſs the Po at Valentia. The armiſtice was ſigned on the 29th of April, and a definitive treaty was concluded at Paris on the 17th of May. The conditions, in ſo far as they concerned his Sardinian majeſty, were unqueſtionably humilitating. The duchy of Savoy was given up to France for ever, as were alſo the counties of Nice, Jende, and Bretueil. An amneſty was granted to all his ſubjects who were perſecuted for political opinions, and he agreed that the French troops ſhould have free acceſs to Italy through his territory. He was to erect no fortreſſes on the ſide of France, to demoliſh thoſe of Brunette and Suſa, and confeſs that his conduct to the laſt republican ambaſſador had been diſreſpectful.

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444 A formal treaty.

The republican army, in the mean time, advanced towards the Po; but Beaulieu was deceived reſpecting one article of the armiſtice, which granted permiſſion to Bonaparte to croſs that river at Valentia. Concluding that the republican chief ſeriouſly intended to croſs at this place, he made every poſſible preparation to oppoſe him, while Bonaparte haſtily penetrated into Lombardy, and, on the 7th of May, was 60 miles down the river to Placentia before the enemy could obtain information of his route. He paſſed the river without difficulty. Six thouſand infantry and 2000 cavalry were diſpatched by Beaulieu to oppoſe the paſſage of Bonaparte acroſs the river when it was too late, by whom they were met and defeated on the following day, at the village of Fombio. As 5000 more advanced to the aſſiſtance of theſe, they were repulſed by La Harpe, at which time that officer was killed. An armiſtice was granted by General Bonaparte on the 9th to the duke of Parma, on condition that he paid 2,000,000 of French money, and delivered 10,000 quintals of wheat, 5000 quintals of oats, and 2000 oxen for the uſe of the army. He likewiſe agreed to give up 20 of his beſt paintings, to be made choice of by the republicans. This laſt meaſure was ſtrongly objected to by ſeveral men of literature and artiſts as ſoon as it was known; but the directory diſregarded every remonſtrance, and gave orders for ſimilar ſtipulations to be inſerted in every ſubſequent treaty.

445 Victory at Lodi.

As General Beaulieu was forced to abandon the Po, he croſſed the Adda at Lodi, Pizzighitine, and Cremona, leaving ſome troops to defend the approaches to Lodi, which were attacked by the advanced guard of the republicans on the 10th, who drove them into the town, and purſued them ſo rapidly, that there was no time left to break down the bridge over the Adda. Here the Auſtrians defended the paſſage with 30 pieces of cannon, and the republican officers, after holding a conſultation, were of opinion that the bridge could not be forced. Bonaparte, however, having demanded of his grenadiers whether they were willing to make the attempt, they commended the propoſal, on which he formed them into a cloſe column, when they availed themſelves of the darkneſs occaſioned by the ſmoke of the enemy's artillery, and reached the middle of the bridge unperceived, where 700 of them periſhed by the Auſtrian cannon: but a number of republican officers flew to the head of the column, urged on the brave ſoldiers, broke into the Auſtrian ranks, and made them fly in all directions.

446 And conſequences of it.

It appears that nothing more was expected from the campaign of Bonaparte in Italy, than to induce the different princes and ſtates to abandon the coalition againſt France, which every one of them aſſiſted either with troops, or with money and proviſions. He made himſelf maſter of Ferrarra, Bologna, and Urbino, granting

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to his Holineſs and the duke of Modena an armiſtice on the uſual terms, we mean large contributions, paintings, and curioſities. The Neapolitan cabinet was ſo terrified in conſequence of his march into the Roman territory, that it requeſted a peace; and Bonaparte agreed to an armiſtice without any of the humiliating conditions demanded from the other ſtates of Italy. He next proceeded to Leghorn, in the neutral ſtate of Tuſcany, in order to drive out the Engliſh, and confiſcate their property. In this manner did he finiſh the taſk aſſigned him, before the commencement of the campaign on the Rhine. It is true that Mantua was ſtill in poſſeſſion of the Imperial troops; but it was in a ſtate of ſiege, and the reſt of Italy was ſubmiſſive to the French republic.

447 Succeſs of the French in Germany.

With a view to leſſen the exertions of the republicans in Italy, the conteſt in Germany was renewed by the Auſtrians. General Jourdan was of conſequence informed, that the armiſtice would terminate, and the war be renewed, on the 31ſt of May. Jourdan at this time had to contend with General Wartenſleben, while the archduke was at the head of the army in the Hundſruck, to oppoſe General Moreau on the Upper Rhine. A ſingular ſtratagem diſtinguiſhed the commencement of the campaign on the part of the French, with a view to decoy the whole of the Auſtrian forces to the Lower Rhine, that an opportunity might thus be afforded to General Moreau of ſuddenly entering Swabia, and carrying the war to the hereditary territories of Auſtria. Jourdan began to make vigorous exertions, and Moreau remained inactive. The lines of Duſſeldorf were left on the 31ſt of May by the left wing of Jourdan's army, under the command of General Kleber, who defeated the Auſtrians in marching towards the Sieg. Advancing with his centre and right wing, Jourdan forced the Auſtrian poſts on the Nahe, effected the paſſage of the Rhine, blockaded Ehrenbreitſtein, and haſtened forward as if he deſigned to form the ſiege of Mentz. Theſe movements brought the archduke into the perilous ſituation of having Moreau in his front, and Jourdan in his rear. He therefore croſſed the river in haſte, leaving the fortreſſes of Mentz and Manheim to retard the progreſs of Moreau. The archduke attacked the advanced guard of General Jourdan, which, after an obſtinate and bloody conflict, he forced to retire. Jourdan, upon this retired to his former poſitions; and Kleber, on the 20th, entered the lines of Duſſeldorf, from which he had taken his departure.

448 Defeat of the archduke Charles.

The archduke had no ſooner withdrawn from the Palatinate to force Jourdan down the Rhine, than Moreau marched ſpeedily towards Straſburgh, by which the hoſtile armies ſeemed as faſt as poſſible to be flying from each other. The paſſage of the river oppoſite to Kehl was effected by Moreau on the 24th of June, which was attended with conſiderable difficulty, a ſudden ſwell having prevented the Auſtrians from being taken by ſurpriſe, which appears to have been the primary intention of the republican commander. The entrenchments on the iſlands occupied by troops, were inſtantly carried at the point of the bayonet, and 2600 republicans effected a landing on the oppoſite ſhore, where they were expoſed to the Auſtrian cannon from the camp of Wilſtedt, and to the cannon of the fort; ſtill, however, they maintained their ground, and likewiſe acted on the offenſive, till the boats returned with reinforcements, when the fort and redoubts were carried by ſtorm, and the Auſtrians retreated towards Offenburgh.

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449 Auſtrians defeated by Moreau.

In conſequence of the archduke's departure to the Lower Rhine in purſuit of General Jourdan, and the detachments ſent to Italy to check the victorious career of Bonaparte, General Moreau was in a ſituation for entering Swabia with a ſuperior force. On the 26th of June he ſucceeded in compelling the Auſtrians to abandon their camp at Wilſtedt, and next day proceeded with his army in three columns, againſt another body of 15,000 men before Offenburgh. A detachment from General Wurmſer was ſent to their aſſiſtance, but theſe were defeated on their march by two republican columns, and Offenburgh was evacuated during the night. The mountain of Knubis was ſeized on the 2d of July by a body of French under General Laroche. This is the loftieſt point in that ridge of mountains denominated the *Black Foreſt*. The Auſtrians were next day driven from the paſs of Friedenſtadt, after an obſtinate reſiſtance, by which their communication with the emigrants under the Prince of Condé was entirely cut off. The Auſtrians were attacked at Raſtadt on the 8th by the left wing of the republican army, commanded by the gallant General Deſſaix, and, after a moſt obſtinate reſiſtance, were obliged to retreat to Ettingen.

450 The French enter Frankfort.

The archduke now arrived with his army on the Lower Rhine, leaving Wartenſleben to check the progreſs of General Jourdan, who began to act upon the offenſive as ſoon as the archduke departed. General Kleber, as before, ſet off from the lines of Duſſeldorf, and the centre and right wing croſſed the Rhine in the vicinity of Coblentz. The French forced the poſts of Ukareth and Altenkirchen, and the whole army under General Jourdan croſſed the Lahn on the 9th of July, and next day Wartenſleben was defeated with great ſlaughter, and the loſs of 500 men taken priſoners; and the republicans entered Frankfort on the 12th. The two imperial armies were now not far from each other, being in the centre between thoſe of Moreau and Jourdan. Had the archduke found it practicable to reſiſt for a little one of theſe two armies of the French by a detachment, while he ruſhed upon the other with the main body of his army, it is not improbable that an end might thus have been put to any further invaſion of the Germanic empire; but the activity of the republican officers was not ſo eaſily checked, nor could their progreſs be arreſted by any partial exertions. His laſt reſource, therefore, was to give battle to Moreau, which was moſt obſtinately fought on both ſides. The French, in their endeavours to force the heights of Rollenſolhe, were four times repulſed, and, after a moſt terrible ſlaughter, they carried the field at the point of the bayonet.

451 The archduke retreats through Swabia.

In conſequence of the loſs they ſuſtained at the battle of Ettingen, the two imperial armies retired eaſtward, the archduke retreating through Swabia towards Ulm, where he had magazines. At every poſt of any ſtrength he made a ſtand, in order to obſtruct General Moreau's progreſs as much as poſſible. Wartenſleben, in his retreat through Franconia, made a ſimilar oppoſition to the march of Jourdan. The archduke was forced by Moreau to croſs the Neckar, and afterwards the Danube, by which means the whole circle of Swabia was in the rear of the republicans. Wartenſleben was forced

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to retreat through Aſchaffenbourg, Wartſburg, Schweinfurt, and was obliged to croſs the Rednitz, in order to ſhun the army of Jourdan, which was preſſing on his rear. Jourdan continued to advance, till his right wing, commanded by General Bernadotte, was poſted at Neumarck, his advanced poſts at Teining, and the main body of the army purſued Wartenſleben beyond the Nab, having arrived at Amberg on the 22d of Auguſt.

452 Great alarm in Germany.

The three republican armies commanded by Moreau, Bonaparte, and Jourdan, were poſſeſſed of the whole country from the frontiers of Bohemia to the Adriatic, exceepting only a part of the mountains of Tyrol, which cauſed an alarm through the whole of Germany. The payment of 4,000,000 of French money procured a peace for the duke of Wirtemberg; and the circle of Swabia obtained it, on condition of paying 12,000,000 of livres, and delivering 8400 horſes, 5000 oxen, 100,000 quintals of wheat, 50,000 quintals of rye, 100,000 ſacks of oats, 100,000 pairs of ſhoes, and a large quantity of hay. Peace was granted to the margrave of Baden upon ſimilar terms. Negociations were alſo entered into by the elector of Bavaria and the circle of Franconia, having offered large ſums in order to procure it. Even the dict of Ratiſbon ſent a deputation to the republican generals to treat for a neutrality. Spain made a treaty with France, both offenſive and defenſive, and war was in conſequence ſoon after declared againſt Great Britain.

453 The houſe of Auſtria in danger.

Bonaparte was detained ſtill in Italy, whereas had it been in his power to croſs the Tyrol at Inſpruck, and reach the Danube, it is more than probable that the emperor of Germany would have been obliged to accept of a peace upon any terms which the conquerors thought proper to propoſe. He was now abandoned by every member of the coalition, Britain alone excepted, whoſe pecuniary aid enabled him to extricate himſelf from the dangers which ſurrounded him. A command of money raiſed one army after another to check the career of Bonaparte in Italy, while his German armies were recruited by extenſive levies, and mercenary troops belonging to the ſtates which had made peace with France.

454 Able conduct of the archduke.

The archduke Charles having received ſtrong reinforcements, came to the reſolution of oppoſing Moreau at Umerſheim. A deſperate battle was of conſequence fought, of 17 hours continuance, when one of the wings of the Auſtrian army ſucceeded in gaining about four leagues of territory in the rear of the republican army; but as the archduke was informed that Wartenſleben could not maintain his ground againſt the efforts of General Jourdan, he deemed it prudent to retreat, and adopt new meaſures. On the 17th of Auguſt, he left General La Tour to be a check upon Moreau, and croſſing the Danube at Ingolſtadt, he marched to the relief of General Wartenſleben, and with united forces determined to fall upon Jourdan. On the 23d he made an attack upon Bernadotte at Teining, whom he compelled to retreat towards Nuremberg. The archduke was now on the right of Jourdan, and Wartenſleben was in front of him, which induced the French commander to retreat on the 24th. Such was the ſtate of the French finances at the beginning of this campaign, that the armies of Jourdan and Moreau were under the neceſſity of plundering wherever they came, to ſupply their immediate wants. This was particularly the caſe with Jourdan's army, which, when it began to retreat, ſuffered almoſt as much from the exaſperated inhabitants as from the oppoſing army. The archduke and Wartenſleben having united their forces, the former was enabled to diſpatch General Nauendorf with reinforcements to La Tour, to keep Moreau in check, while he continued his purſuit of Jourdan towards Wurtzburg, where the French made a ſtand, and a ſevere engagement took place on the 3d of September. In this, General Jourdan was the greateſt ſufferer, and he continued his retreat during the night. Having croſſed the Lahn, he made a feeble reſiſtance, and marched along the banks of the Rhine, till his army, on the 17th, arrived at Coblentz and Duſſeldorf, from which it had formerly departed.

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455 Moreau's ſituation highly critical.

The army of Moreau was now in a ſituation extremely perilous, yet he maintained his poſition till the 17th of September, the very day on which Jourdan reached Duſſeldorf; but he was obviouſly in a wavering condition as to his future movements, and one of the greateſt generals Europe ever beheld was now at a loſs what ſtep to take. He made an unſucceſsful effort to draw the archduke from the purſuit of Jourdan. Many attacks were made upon him, but without effect; and the Auſtrian generals gave way to him wherever he turned. But finding that the retreat of Jourdan was irretrieveable, and that General Bonaparte was ſtill detained in Italy, he finally reſolved to retreat. To prepare for this arduous undertaking, he had croſſed the Lech, which he ſuddenly repaſſed, as if fully determined to penetrate farther into Auſtria, and compelled La Tour to fall back to Lanſberg. Having thus obtained a free paſſage for his future movements, he began his ever memorable and unexampled retreat, paſſing between the Danube at Ulm and the lake of Conſtance, while La Tour continued preſſing upon his rear. The paſſes of the Black Foreſt were occupied by numerous bodies of Auſtrians and armed peaſantry, while his right flank was haraſſed by Generals Nauendorf and Petraſch, at the head of 24,000 men. He turned once more upon La Tour with terrible impetuoſity, defeated him, and took 5000 priſoners, whom he was able to carry to France. He after this continued his retreat, checking Nauendorf and Petraſch with the right wing of his army under General Deſſaix, and the reſt of the army cleared the paſſages in front, till he reached the Valley of Hell, a narrow defile extending for ſome leagues between lofty mountains, and in particular parts of it not more than a few fathoms broad. This paſſage was forced by the centre of his army in a maſs, and the wings oppoſed the enemy under Nauendorf and La Tour. After this dreadful effort, he arrived at Fribourg on the 13th of October. The archduke, on his arrival from the purſuit of Jourdan, forced him to abandon his poſitions on the Swabian ſide of the Rhine, Kehl excepted, and a temporary fortification at Huningen, called a bridge-head.

456 His unparalleled retreat.

457 French frontier at this time defenceleſs.

As the French frontier at this time was in a defenceleſs ſituation, the Imperial troops took advantage of it to croſs the Rhine at Manheim, and march in different detachments to Weiſſemburg, Seltz, Hagenau, and nearly to the very gates of Straſburgh, levying contributions, and demanding hoſtages wherever they came. When theſe detachments were recalled, the archduke

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archduke formed the reſolution of terminating the campaign by the reduction of Kehl and the fortification at Huningen, which he found to be no eaſy taſk. At both theſe places a communication was open with the French ſide of the river, and the diviſions of General Moreau's army did duty at them alternately. Much of the winter was ſpent by the Auſtrians in endeavouring either to carry them by ſtorm, or to reduce them in conſequence of a regular ſiege. The French at laſt agreed to evacuate Kehl on the 10th of January, and the fortification at Huningen was ſurrendered in the month of February.

458 Bonaparte victorious in Italy.

Although the republicans in Germany experienced very conſiderable reverſes of fortune, as we have juſt now ſeen, yet Bonaparte in Italy continued victorious. Having laid all Italy under contribution, he enjoyed the means of preſerving a ſeeure and ſteady diſcipline over a well paid army. The mode of fighting which he adopted in all deſperate caſes, was that of the cloſe column; the favourite method of Epaminondas and Guſtavus Adolphus. The ſtile, too, in which he addreſſed his army before any great action, was well adapted to inſpire them with enthuſiaſm. His ſpeech to his army when he firſt entered Lombardy, deſerves to be remembered. "Soldiers, you have ruſhed like a torrent from the ſummit of the Appenines, you have driven back and diſperſed all who oppoſed your march. Your fathers, your mothers, your wives, your ſiſters, your ſweethearts, rejoice in your ſucceſs, and boaſt with pride of being related to you. But remains there nothing more for you to effect? Shall poſterity reproach us with having found a Capua in Lombardy? But I already ſee you ruſhing to arms; an unmanly repoſe fatigues you, and the days loſt to glory are loſt to your felicity. But let the people be tranquil; we are the friends of all nations, and more particularly of the deſcendants of the Brutuſes, the Scipios, and the illuſtrious perſonages whom we have choſen as models. To reſtore the capitol, to replace with honour the ſtatues of the heroes who rendered it renowned, and to rouſe the Roman people, become torpid by ſo many ages of ſlavery, ſuch will be the fruit of your victories; they will form an epoch to poſterity, and you will have the immortal glory of renovating the faireſt portion of Europe. The French nation, free and reſpected by all the world, will give to Europe a glorious peace. You will then return to your homes, and your fellow-citizens, who, when pointing to you, will ſay, "He was of the army of Italy."

459 Siege of Mantua.

Bonaparte took up the firſt part of the month of July in commencing a regular ſiege againſt Mantua, expecting to be maſter of that city towards the end of the month. In this, however, he proved too ſanguine, for the military efforts of Auſtria were very great, and the pecuniary aid of Britain was not refuſed. Twenty thouſand troops were ſent from the Rhine, beſides vaſt numbers from different quarters, ſo that he was obliged to raiſe the ſiege, and provide for his own ſafety in the beſt manner he could. Maſſena was driven from his poſt at La Corona on the 29th of July, while 15,000 Auſtrians drove the republicans from Salo, and next from Breſcia, with the whole of the ſtores and magazines belonging to the army of General Bonaparte. The Imperial troops, however, committed a fatal blunder in their plan of operations, by dividing into two parts an army which, when united, was a match for the enemy, and placing Bonaparte between them. Of this blunder the republican chief was fully aware, and did not fail to take advantage of it. He unexpectedly raiſed the ſiege of Mantua, and leaving a ſmall body of troops to check the Auſtrians, he marched rapidly weſtward, and retook Breſcia, with the magazines and hoſpitals, on the 1ſt of Auguſt. As he had the maſs of his army with him, he exceeded his enemies in numbers wherever he attacked them. Forming a large body of his troops into cloſe columns, the Auſtrians extended their line with the view of ſurrounding him, being not yet acquainted with his manner of fighting, by which means he penetrated their line in all directions, and threw them into the greateſt confuſion. He made 4000 priſoners, and took 20 pieces of cannon. A diviſion of them finding Salo in poſſeſſion of the republicans, wandered about in ſearch of a road, by which to make their eſcape, when they ſummoned Lonado to ſurrender, believing that the bulk of the French army had gone in ſearch of Wurmſer to give him battle. This was indeed the caſe; but Bonaparte was in Lonado with no more than 1200 men. Although this event no doubt gave him much uneaſineſs, yet with great preſence of mind he threatened to deſtroy their whole diviſion for inſulting the French army, by ſummoning its commander in chief to ſurrender. The Auſtrian officers believed that the whole army was in the place, ſo that by this ſingular ſtratagem 4000 men were indueed to throw down their arms.

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460 Defeat of Wurmſer.

Marſhal Wurmſer was attacked by Bonaparte on the 5th and 6th, and driven from Peſchiera and the river Mincio. The Auſtrians were obliged to quit Verona on the 7th, and again to betake themſelves to the mountains of Tyrol; loſing in a conteſt of ſix days upwards of 20,000 men, but fortunately three-fourths of them were priſoners. The ſiege of Mantua was again begun by the French, whoſe works the enemy had enſtroyed in their abſence, and taken 140 pieces of cannon into the city which they had left behind. By this loſs, the French could not undertake a regular ſiege, and General Wurmſer was in a condition to attempt the relief of it by the beginning of September. Bonaparte having been appriſed of his approach, left troops behind him to carry on the blockade, while he directed his march northward with the main body of his army, drove the Auſtrians from St Marco and Roveredo to the paſs of Calliano, where they made a ſtand. Here an engagement enſued, in which the Auſtrians loſt 6000 men taken priſoners, and the French entered Trent in triumph. Inſtead of retiring from the hero who had vanquiſhed him, Wurmſer threw himſelf into Baſſano, upon the flank and rear of Bonaparte, and then marched with rapidity towards Mantua. He endeavoured to make a ſtand at Baſſano, but was defeated with the loſs of 5000 men taken priſoners. He croſſed the Adige at Porto Legnago, and entered Mantua with no more than 8500 men, infantry and cavalry. Great as this veteran's loſs was, it had the effect of detaining Bonaparte in Italy, to watch the numerous garriſon of Mantua. He expected that its numbers would very ſoon reduce it by famine to the neceſſity of capitulating, but in this he found himſelf diſappointed, as the fleſh of the 4500 horſes which Wurmſer carried into it, afforded ſubſiſtence to the troops for a long time.

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Such was the fame of Bonaparte as a general, on account of the victories he obtained over the Auſtrians, that his countrymen, the Corſicans, diſcovered an inclination to throw off the Britiſh yoke, and be united to France. They became of courſe, ſo mutinous, that the viceroy deemed it neceſſary to evacuate the iſland, the ſubmiſſion of Italy to the republic having greatly diminiſhed its value. The imperial ſubjects of Italy, together with the inhabitants of Bologna, Ferrara, and Modena, now began to form themſelves into republics, under the patronage of General Bonaparte; they ſent deputies to the convention, raiſed troops, and aboliſhed all orders of nobility.

461 Revolt of Corſica from Britain.

462 The Auſtrians partially ſucceſsful.

The emperor ſoon after endeavoured to relieve Mantua, by ſending another army into Italy, under the command of General Alvinzi, who having croſſed the Piava, was met by the republicans, and compelled to repaſs the river. Davidovich with his diviſion having driven the French down the Adige towards Verona, General Bonaparte found it neceſſary to concentrate his forces. He therefore left General Vaubois as a check to the progreſs of Davidovich, and marched in perſon againſt General Alvinzi, and was met by the Auſtrians at the village of Arcole. As this village could not be turned ſpeedily, on account of a canal, the French were obliged to attempt the paſſage of a narrow bridge in the face of the Auſtrian fire. Their officers ruſhed to the head of the column which had undertaken it, but in vain endeavoured to rally them. Angereau advanced to the end of the bridge with a ſtandard; but he was followed by none, when the commander in chief haſtened to the bridge and exclaimed, Grenadiers, follow your general! They followed till within 30 yards of the bridge, when they were intimidated by the tremendous fire of the Auſtrians, and Bonaparte judged it proper to fall back. In the evening General Guieux took the village at the head of 2000 men, but again left the Auſtrians in the poſſeſſion of it. On the 16th of November a deſperate engagement took place in the vicinity of Arcole; and next day the Auſtrians preſſing on the centre of the republican army, were unexpectedly taken on their flank by the left wing of the enemy, which was lying in ambuſcade. Bonaparte ſent a party of horſe and 25 trumpeters round to the rear of the Auſtrians, who concluded from the terrible noiſe, that they were ſurrounded, and fled on all ſides in the utmoſt confuſion.

Having driven Alvinzi acroſs the Brenta, Bonaparte returned; the poſitions of Rivoli and La Corona were reſumed, and Davidovich driven back into Tyrol. General Wurmſer ſtill defended Mantua during the remaining part of the year; ſo that nothing farther may be ſaid to have been gained by ſo many victories, but to conſider Bonaparte as their only invincible commander.

463 Negotiations between Britain and France.

During theſe tranſactions in the field of battle, Great Britain made a laudable effort to negotiate with France. Paſſports were obtained from the directory, and Lord Malmeſbury ſet out as ambaſſador to Paris. He began the negotiation with De la Croiz, the miniſter for foreign affairs; but his lordſhip ſoon found that the directory had no ſerious intention of concluding a treaty with Britain. While the Britiſh miniſtry, as individuals, did not approve of a peace at that time, yet officially they conſidered it as proper, if it could be obtained upon honourable terms. It was propoſed by Lord Malmeſbury, that the principle of mutual reſtitutions ſhould be agreed upon as the baſis of the treaty, and the directory wiſhed that the objects ſhould be ſpecified. Lord Malmeſbury therefore ſaid, that the French ſhould give up the Auſtrian Netherlands, for which Britain would give up the foreign ſettlements belonging to the republic. Many of the Dutch poſſeſſions abroad were alſo to be relinquiſhed, on condition that the authority of the ſtadtholder ſhould be acknowledged. He was next required to give in the ultimatum of his conditions in 24 hours; and on complaining of this demand, he was informed on the 19th of December, that the directory would agree to no conditions repugnant to the French conſtitution; and he was informed that his farther reſidence was unneceſſary.

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464 Cape of Good Hope taken by the Britiſh.

During this year Great Britain maintained her accuſtomed ſuperiority at ſea. The Cape of Good Hope was taken by Admiral Elphinſtone on the 16th of September 1795, which the Dutch were extremely anxious to recover, for which purpoſe they advanced money to the French to fit out a ſquadron to combine with them in an attempt to reduce it. Seven ſhips of war were ſent to retake the Cape, under the command of Admiral Lucas, but having been caught between two fires, he could not effect his eſcape, and therefore he ſurrendered to the Britiſh admiral without firing a gun.

465 The French make an unſucceſsful attempt on Ireland.

Although Britain was ſuperior by ſea, yet an invaſion of Ireland was attempted by the French in the end of 1796; but as folly ſeemed to have concerted the plan, it was of conſequence abortive. The whole was committed to one man, General Hoche, without any ſecond to occupy his place in the event of an accident. The diſaffected party in Ireland had received no information of their approach, and the fleet was ſent towards a part of the country where the people were not very much diſpoſed to receive them. In this expedition 18 ſail of the line, 13 frigates, 12 ſloops, and tranſports with 25,000 men, were employed. It was detained for ſome time when ready for ſailing, in conſequence of a mutiny. Hoche ſet ſail on the 10th of December, but in working out of Breſt, a ſhip of the line was loſt, and ſome more of them conſiderably damaged. The frigate which had on board the commander in chief was ſeparated from the fleet by a gale of wind, in conſequence of which, when moſt of the fleet arrived at Bantry Bay, they were without inſtructions how to proceed. The officers and troops wiſhed to land, but Admiral Bouvet refuſed to comply. After remaining for ſome days on the coaſt, he ſailed for France, and reached Breſt with part of the fleet on the 31ſt. General Hoche reached Bantry Bay when it was too late, and conſequently could not land. One ſhip of the line, and two frigates foundered at ſea, a frigate was captured by the Britiſh, and a ſhip of the line was run aſhore, to prevent her from being taken.

466 Advantages gained by the Auſtrians.

In the beginning of the year 1797, the archduke Charles was ſtill employed in his endeavours to reduce Kehl, and the fortifications oppoſite to Huningen, Moreau being ſtill his antagoniſt. General Hoche was appointed to ſucceed Jourdan on the Rhine, and Bonaparte was ſtill engaged in the ſiege of Mantua, while powerful efforts were making to recruit the army of Alvinzi. The youth of Vienna were requeſted to grant their aſſiſtance, when 6000 of them volunteered their ſervices

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ſervices for Italy. General Alvinzi's army was now 50,000 ſtrong, with which he continued to alarm the republicans in all directions, in order to conceal from them the plan of his future operations. Bonaparte was ſtill at Bologna, to prevent the eſcape of General Wurmſer by that quarter, which he underſtood, by an intercepted letter, was his deſign. Having been informed of the approach of the Auſtrian army, he haſtened to Mantua, and from that city to Verona, where the centre of his line was oppoſed to Alvinzi; but as the Auſtrians continued to attack all quarters at once, he could not penetrate the deſign of their commander. On the 13th of January the movements of the enemy became more ſerious on the lower part of his line near Porto Legnago; but in the evening being informed that the upper extremity of it under Joubert, had been attacked by vaſtly ſuperior numbers, there he concluded that the Auſtrians were in greateſt force. Still the Auſtrians perſiſted in the abſurd plan of dividing their army—an abſurdity which melancholy experience had not taught them to correct. Ten thouſand troops, including the Vienna volunteers, received orders to proceed to Mantua by Porto Legnago, at the lower end of the republican line, while Alvinzi in perſon advanced againſt Joubert, who was forced to retreat, and was reduced to ſuch a ſituation, that the capture of his whole diviſion on the following day (the 14th) ſeemed highly probable.

467 They are defeated.

Bonaparte having received information reſpecting the ſtate of affairs, left Verona on the 13th, having ordered Maſſena to follow him with the centre to Rivoli as faſt as poſſible. On the 14th, at the break of day, the diviſion of Joubert made an attack on the Auſtrians, at which they were very much ſurpriſed, not knowing that Bonaparte had arrived with reinforcements. The ſuperior numbers of the Auſtrians defeated all the endeavours of the French troops to turn their diviſions; and the two wings of the republican army were driven back upon the centre in conſiderable confuſion. Alvinzi engaged the centre, which with difficulty maintained its ground; and the Auſtrian wings advancing on both ſides, entirely ſurrounded the French. The victory ſeemed already won, and it is even reported that General Alvinzi ſent a courier to Vienna, to announce the approaching capture of Bonaparte and all his army. There can be no doubt that the republican chief was now greatly alarmed, yet he ſtill conſidered it in his power to make a laſt effort. Forming three ſtrong columns, he diſpatched them againſt the right wing of the Auſtrians, which they penetrated at various points, and made it fly in ſuch confuſion that, having met a party of republicans which had not arrived in time to join the army, 4000 Auſtrians laid down their arms, and ſurrendered themſelves priſoners of war. Bonaparte apprehending that this part of his line was no longer in danger, left Joubert to proſecute the victory, and went to oppoſe the march of Provera. A party under General Murat having continued their march all the night of the 14th after the battle, ſeized on Montebaldo in the rear of the poſition at Corona, to which part of the Auſtrians retreated, while Joubert on the following morning attacked them in front. Being thus ſurrounded, they were thrown into confuſion, 6000 of them were taken priſoners, and numbers periſhed in attempting to croſs the Adige.

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During this bloody conflict on the upper part of the river, General Provera forced his paſſage acroſs the lower part of it near Porto Legnago, and obliged the republican general Guieux to retreat to Ronco. As Provera was marching rapidly to Mantua, General Angereau came up with his rear, and made 2000 priſoners; but the Auſtrian general reached the neighbourhood of that city on the 15th, which was blockaded at St George and La Favourite. He ſummoned the republican commander here to ſurrender, but he having refuſed to comply, Provera endeavoured, without ſucceſs, to carry it by aſſault. He next made an attack upon La Favourite, and was ſeconded by Wurmſer with the troops in the garriſon, who had perceived his arrival; but as Bonaparte had arrived with reinforcements, General Wurmſer was defeated, and Provera being ſurrounded by the French, ſurrendered himſelf and his troops as priſoners of war. In conſequence of theſe engagements at Rivoli and Mantua, the Auſtrians loſt 23,000 men taken priſoners, and 60 pieces of cannon. The ſurrender of Mantua was now inevitable, on account of abſolute famine, and therefore it capitulated on the 2d of February. That Bonaparte might allow the French emigrants to eſcape, he allowed General Wurmſer to ſelect and take out of the garriſon 700 men who were not to be examined, nor viewed as priſoners of war, and the general himſelf was to depart unconditionally.

468 Surrender of Mantua.

469 The pope's forces ſubdued.

The moſt active and vigorous preparations were making by the emperor and the French, for recommencing their bloody conteſt on the German frontiers, and therefore it was of importance for Bonaparte to leave Italy in his rear in a ſtate of tranquillity. He ſent General Victor on the 1ſt of February, together with the *Lombard legion*, to enter the papal territories; and after the ſurrender of Mantua, General Bonaparte followed in perſon. The Lombard legion, after ſtorming the entrenchments of the pope's troops, made 1000 of them priſoners, and took all their cannon. General Colli had carried away moſt of the treaſure from the chapel at Loretto; but the republicans ſtill found articles of gold and ſilver worth a million of livres, and the image of the virgin was ſent to Paris as a curioſity. At Tolentino the republican chief was met by a meſſenger from the pope with an overture of peace, and a treaty was concluded on the 19th. The pope promiſed to pay 15,000,000 of livres, and to deliver 800 cavalry horſes, with a like number of draught horſes and oxen. He alſo agreed to pay 300,000 livres to the family of the French ambaſſador Baſſeville, whom the rabble had murdered at Rome, and to make an apology by his miniſter at Paris for that event.

470 Reinforcements ſent to Bonaparte.

The French having been ſo unfortunate in their invaſion of Germany by the way of Swabia and Franconia, now determined to make their principal attempt from Italy under the command of General Bonaparte. Vaſt bodies of troops were therefore detached by the directory from thoſe who had ſerved under Moreau, and ſent as ſecretly as poſſible towards Italy by the way of Savoy. The impending danger was however perceived by the court of Vienna, and therefore gave the command on the ſide of Italy to the archduke Charles, he being the only Auſtrian who had hitherto been ſucceſsful againſt the republicans. The war was now about to be carried into new territories, where a foe

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foe had ſcarcely ever been ſeen by the houſe of Auſtria. It was neceſſary that Bonaparte ſhould once more force his way over the Alps, that immenſe chain of mountains which riſes in the neighbourhood of Toulon, and ſtretching northward, obtains the names of Piedmont and Savoy. It then takes an eaſterly direction, forming the countries of Switzerland, Tyrol, Carinthia, and Carniola. The three laſt of theſe paſſing along the Adriatic, conſtitute the frontier, in this quarter, of the hereditary ſtates of Auſtria. The fertile and level country, which belonged to Venice, lies between the mountains and the ſea. It is croſſed by many ſtreams which are increaſed by the melting ſnows of the Alps, and whoſe peculiar characteriſtic is this, that they are greateſt in ſummer, and leaſt in winter.

471 Error of the court of Vienna.

The archduke, inſtead of making a ſtand in the defiles of the mountains, was ſent into the plain to guard the paſſages of the rivers; a very important blunder which entered into the plan of defence adopted by the council of war at Vienna.

472 Progreſs of Bonaparte's army.

While Bonaparte continued to advance to the territories of the pope, the arrangement of the Auſtrian army was going forward along the eaſtern bank of the Piava. The republicans were on the oppoſite ſide, and Bonaparte, after quitting the papal territories, haſtened to join them. Having effected the paſſage of the Piava on the 12th of March, the Auſtrians retired, ſkirmiſhing for ſome days, till they croſſed the Tagliamento, where they halted with their whole force. The republican army reached, on the 17th, Valveſone, on the oppoſite ſide of the river, which after ſome heſitation they determined to croſs. The ſtream having been diminiſhed by the froſt, the French croſſed it in columns at different points. Joubert with the left wing received orders to paſs along the valley of the river Drave, beyond the higheſt chain of the *Noric Alps*. Maſſena at the head of the centre diviſion, paſſed into the defiles of theſe mountains, and the right diviſion, commanded by Bonaparte, marched along the coaſt of the Adriatic.

473 Surrender of Gradiſca.

On the 19th, the town of Gradiſca, on the river Liſonzo, ſurrendered to the right wing of the army; and its garriſon, conſiſting of 3000 men, were made priſoners. The ſame diviſion entered Goritz on the 21ſt, where it found the principal magazines and hoſpitals belonging to the Auſtrians. Trieſte was taken on the 23d, and materials worth 2,000,000 of livres were ſent off by the French from the quickſilver mines of Ydria. On the 24th a large body of Auſtrians was confined by Maſſena, and a part of the right wing commanded by General Guieux; but they having procured reinforcements from the archduke, engaged the French next day, and were defeated, having loſt 5000 priſoners and 400 baggage waggons. Equal ſucceſs attended the left wing under Joubert, Baraguay, D'Hilliers, and Delmas. Four thouſand Auſtrians were taken on the banks of the Lavis, and they were defeated at Clauzen, with the loſs of 1500 priſoners. This diviſion then directed its march eaſtward, along the valley of the Drave towards Clagenfurt, the metropolis of Carinthia, where it was met by General Maſſena, that officer having obliged the archduke to evacuate his headquarters, and proceed nearer to the capital of the empire, which now began to be in danger. In 15 days General Bonaparte took 20,000 priſoners, and effected the paſſage of the Alps, after which there was no place of ſufficient ſtrength to arreſt his progreſs to Vienna. Yet it muſt be confeſſed that his own ſituation was not free from danger, and therefore he prudently embraced this moment of unprecedented ſucceſs to make overtures of peace. He wrote to the archduke on the 31ſt of March, deprecating the continuance of the war, and entreating him to uſe his influence for putting a period to its ravages. This prince evaſively replied, that it did not belong to him to inveſtigate the principles on which the war was carried on, and that he had no power to negotiate.

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474 Partial ſucceſs of the Auſtrians.

The Auſtrians raiſed the peaſantry in the Tyrol, to haraſs the rear of the French army, by which they gained ſome advantages under General Laudohn, and drove out the republican troops which had been left at Botzen and Brixen. The people of the Venetian ſtates acted a ſimilar part againſt the troops left in them, and with the aſſiſtance of 10 Sclavonian regiments, they murdered every Frenchman they could find, not ſparing even the ſick in the hoſpitals, of whom 500 were maſſacred at Verona. The Auſtrians attempted to ſurround the invading army; but Bonaparte knew that the embarraſſment of the court of Vienna was at leaſt equal to his own. He was at the head of 95,000 men, hitherto irreſiſtible; and the Auſtrians could not but know that to ſurround his army was not to vanquiſh it, on which account he perſiſted in advancing. On the 2d of April, after a bloody conflict, he forced the ſtrong defiles between Freiſach and Newmark, making 600 priſoners. His advanced guard reached Hunſmark on the 4th, where they again defeated the Auſtrians, which induced the cabinet of Auſtria to treat for peace, there being no place where the army of the archduke could make a ſtand, till it came to the mountains in the neighbourhood of Vienna. Bellegarde and Morveld requeſted a ſuſpenſion of hoſtilities from Bonaparte, while care was taken to remove the public treaſure and effects into Hungary. The French commander conſented, on condition of getting poſſeſſion of Gratz and Leoben, about 50 miles from Vienna. This was on the 7th of April, and the armiſtice which was to expire on the 13th, was afterwards renewed for a longer period. A preliminary treaty followed this on the 19th, by which the French were to retain the Auſtrian Netherlands, and the republic of Lombardy ſhould be called the Ciſalpine republic, comprehending the Milaneſe, Mantua, Modena, Ferrara, and Bologna. Bonaparte conſented to return to Italy, if his army ſhould be ſupplied with proviſions during its march, and all farther diſputes were to be ſettled by a definitive treaty of peace. He brought an accuſation againſt the Venetian government for conniving at the murder of the French during his abſence, and having poſſeſſed himſelf of the city and territories, he diſſolved that ancient ariſtocracy.

475 Peace concluded between France and Auſtria.

During the approach of Bonaparte towards Vienna, the republican armies on the Rhine were preſſing on the Auſtrians, that they might not have it in their power to ſend reinforcements againſt him. An armiſtice was offered by the Auſtrians, but ſince the French required Ehrenbreitſtein as a compenſation, both parties reſolved to proſecute the war. The left wing of the army of General Hoche proceeded from Duſſeldorf, while the centre and right wing croſſed the river near Coblentz. On the 18th of April a fierce conteſt took place be-

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tween the hoſtile armies near the Lahn, in which the Auſtrians loſt 4000 taken priſoners. General Moreau having forced the paſſage of the Upper Rhine near Straſburg, attacked and carried the village of Dierſheim. Next day the conflict was renewed with ſuch vigour on the part of the republicans, that the fort of Kehl was taken, and 5000 Auſtrians were made priſoners. They were next purſued towards the Danube, when all military operations were inſtantly ſuſpended by meſſengers diſpatched through Germany from the archduke and Bonaparte, with the joyful news that peace was concluded. On the arrival of theſe meſſengers, the army of General Hoche was making a deſperate attack upon Francfort on the Maine, which General Warnecht was employing every effort to protect. Both armies ſuddenly received the news, the hoſtile troops threw down their arms, and congratulated each other on the happy event.

476 Changes in the directory.

A conteſt of an alarming nature was now faſt approaching between the legiſlative and executive branches of the French government. A third part of the legiſlative body was now to be changed. On the 19th of May, Letourneur went out of the directory by lot; on the 20th, the new third took their ſeats, and on the 21ſt Barthelemy was choſen a member of the directory in the room of Letourneur. Pichegru, Jourdan, and Willot, were among the members of the new third, ſo that a decided majority of both councils was of the moderate party; and two members of the directory, Carnot and Barthelemy, were underſtood to be men of the ſame deſcription. Every meaſure was adopted which tended to render the Mountain party odious, or embarraſs the directory.

477 New plan of finance;

Gilbert Deſmolieres, on the 14th of June, brought up a report from a committee on the ſtate of the finances, in which he inveighed againſt the prodigality and profuſion of the directory and its agents in the ſtrongeſt language. A new plan of finance was propoſed by the ſame committee on the 18th, which went to take from the directory the adminiſtration of the public money. On the preceding day Camille Jourdan preſented a report of great length on the ſubject of religion, wherein he inſiſted on the impropriety of forbidding its ceremonies to be publicly diſplayed, and the iniquitous nature of that perſecution which its miniſters had ſuffered, becauſe they could not take the oaths preſcribed by the legiſlature. The council of five hundred decreed, on the 15th of July, that all the laws againſt refractory prieſts ſhould be repealed; and on the following day a decree requiring from them an oath of fidelity to the conſtitution, was carried by a majority of no more than

478 and lenient meaſures in favour of the prieſts.

ſix members. Emery, a new member, propoſed the repeal of thoſe laws by which the property of emigrants had been confiſcated, and that their relations ſhould be conſidered as competent to ſucceed them. Such as had fled into foreign countries from Toulon and other parts of the nation, received encouragement to return home, and allowed to cheriſh the expectation that their names would be expunged from the liſt of emigrants.

479 The royaliſts aſſume freſh courage.

The diſcuſſion which theſe topics underwent made the directory and the councils profeſſed enemies to each other. The latter wiſhed the former to be changed before the expiration of the legal time, and the directory wiſhed to deprive many new members of their ſeats who had been elected by the people. As Barras was rather the moſt odious member of the directory, an effort was made to deprive him of his ſeat, under the pretence that he was leſs than the legal age of 40; but his colleagues maintained that he was born in the year 1755, and it ſeems no proof of the contrary could be produced. Still the directory did not want a number of adherents. The reſolution of the councils in favour of the prieſts had the appearance of a counter-revolution, which induced the royaliſts to reſume courage, and journals were rapidly publiſhed in defence of their cauſe. The councils received information on the 20th of July, that a diviſion of the army under General Hoche was within a few leagues of Paris, while the conſtitution declared that the directory incurred the penalty of ten years impriſonment, if it brought any troops nearer the reſidence of the legiſlative body than twelve leagues without its conſent. An explanation was demanded, when the directory declared their ignorance of the march, having been undertaken without any orders from them, and purely owing to a miſtake of the officer by whom it was conducted: but the councils paid little regard to ſuch an allegation. The mutinous ſuburb of St Antoine adhered to the majority of the directory, which encouraged them ſo much, that they loſt no time in proceeding to action. General Angereau had been ſent for from Italy, under the pretext of delivering to the directory ſome ſtandards taken from the enemy. The Thuilleries was ſurrounded by Angereau on the morning of the 4th, with a diviſion of the troops, when the guard of the councils refuſed to act againſt them, and Ramel their commander was made priſoner. On entering the hall, he found Pichegru and twelve more of the chiefs of the oppoſite faction, whom he immediately ſent priſoners to the Temple. Carnot made his eſcape on the preceding evening, but Barthelemy remained and was put under arreſt. When ſeveral members of the councils came to the hall at the uſual hour, they were aſtoniſhed to find that ſeals had been put upon the doors, and that they could not find admittance. They were ordered to go to the ſurgeons hall, where the directory, it was ſaid, had appointed them to meet. Of both councils not more than 120 members aſſembled, who ſent to obtain from the directory an account of the late proceedings. They were given to underſtand that what had been done was abſolutely neceſſary for the ſalvation of the republic, congratulating the duped councils *on their eſcape* from the machinations of the royaliſts. According to the report of Boullay de la Meurth, a vaſt royaliſt conſpiracy, the centre of which was in the boſom of the councils, was endeavouring to ſubvert the conſtitution, but that the indefatigable diligence and activity of the directory had defeated all their attempts! It was propoſed to tranſport the conſpirators without a trial, and the councils were ſo completely impoſed upon as to vote the tranſportation of 53 of their own members, and twelve other perſons, among which number were included the directors Carnot and Barthelemy.

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During the whole of theſe tranſactions the city of Paris remained in a ſtate of tranquillity. Its unfortunate ſtruggle on the 5th of October had ſo completely ſubdued the ardour of the inhabitants, that they allowed the national repreſentation to be violated with impunity, and liberty to be trampled under foot, without a ſingle exertion in its defence. The directory ex-

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cuſed their conduct to the nation under pretence of the exiſtence of a royaliſt conſpiracy. General Pichegru, it was ſaid, had offered to join the emigrants under the prince of Condé, and the Auſtrians commanded by General Wurmſer, and with this aggregate force to march directly to Paris, for the re-eſtabliſhment of royalty. There are certain circumſtances which lead us to ſuſpect that this was a fabrication: for at the time when this ſuppoſed correſpondence became public, it was denied to be genuine; and Moreau who was implicated in this conſpiracy, was afterwards employed in the ſervice of the republic, to whoſe military ſkill and fidelity the French rulers ſeemed willing to commit the ſalvation of the country.

480 Treaty of Campo Formio.

The directory was now very powerful, but its members ſoon became giddy from the elevated nature of their ſituation, and ſeemed to act under the dangerous conviction, that there was nothing in which they might not venture to engage, whatever might be the rapacity or ambition attached to it. While contending with the councils, they prolonged the negotiations with Lord Malmeſbury, acting in a ſimilar manner reſpecting thoſe which had been entered into between Bonaparte and the imperial ambaſſadors at Campo Formio. Great Britain offered to make peace with France, if permitted to retain poſſeſſion of the Cape of Good Hope, together with the Spaniſh iſland of Trinidad. The negotiations with the emperor were ſpeedily terminated, and on the 17th of October a definitive treaty was ſigned at Campo Formio. The Netherlands were given up to the republic, the Milaneſe to the Ciſalpine republic, and his territories in the Briſgaw to the duke of Modena, to compenſate for the loſs of his duchy in Italy. It was likewiſe agreed by the emperor that the French ſhould poſſeſs the Venetian iſlands in the Levant, namely, Corfu, Zante, Cephalonia, Santa Maura, Cerigo and others. The emperor was to have the city of Venice with its remaining territory, from the extremity of Dalmatia, as far as the Adige and the lake Garda. The Auſtrians accordingly left the Rhine, by which means the republicans were enabled to ſurround Mentz and Ehrenbreitſtein, the former of which was captured in a ſhort time, but the latter required a very tedious blockade before it would ſurrender. Venice was at the ſame time entered by the Auſtrians, the French having left it, and Bonaparte, when about to march out of Italy, left 25,000 men to garriſon Mantua, Breſcia, Milan, and ſome other places, and to preſerve this new republic in a ſtate of dependence upon France.

481 A body of French troops land in Wales.

It is ſaid that the directory about this time endeavoured to force America to purchaſe a forbearance from war by a large ſum of money together with a private preſent of 50,000l. to the members of the directory. The laſt part of this charge was denied by the miniſter Talleyrand, but the general impreſſion it produced could not be effaced, and the directory was thus very much injured in the eſtimation of ſuch countries as were otherwiſe diſpoſed to view it in a very favourable light. To leſſen its reputation ſtill more, it cauſed the councils to paſs two laws, by which all neutral ſhips on their way to Britain, or returning from it, ſhould be liable to be ſeized. This, however, produced an effect very different from that which was intended; for having put all the trade of the weſtern world into the power of the Britiſh, they enriched the very people whom they were meant to ruin. Britain at this time held the empire of the ſeas in ſuch an eminent, and perhaps we may add, unprecedented degree, that the republican fleets lay blockaded in their own ports during the greater part of the year. This expedition againſt Ireland having completely failed, the directory was at a loſs how to diſpoſe of the galley ſlaves who had made a part of Hoche's army deſtined againſt Ireland. It would have been cruel to remand them back to puniſhment; the troops would not ſerve with them in the army, and by the new laws of France they could not receive a pardon, neither was it prudent to give ſo many criminals liberty. Thus perplexed, the directory at laſt determined to ſend them over to England. They were landed from two frigates and ſome ſmall veſſels on the coaſt of Wales, with muſkets and ammunition, but deſtitute of artillery. On the evening of the day on which they landed (23d of February), they were made priſoners of war by a party of militia, yeomanry, cavalry, colliers and others, under the command of Lord Cawdor.

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482 Defeat of a French fleet by Sir John Jervis.

Although the navy of France continued in port, and therefore out of danger for the remainder of this year, yet the Dutch and Spaniſh allies of that country ſuſtained very ſerious loſſes by ſea. A Spaniſh fleet of 27 ſail of the line, oppoſed to a Britiſh fleet of only 15 ſail, under the gallant admiral Sir John Jervis, was completely defeated on the 14th of February, off Cape St Vincent. The Britiſh admiral paſſed twice through the enemy's line, and cut off part of their fleet from the reſt. Four ſhips were taken, and the admiral's own ſhip made her eſcape with conſiderable difficulty. This fleet was on its way to Breſt in order to effect a junction with the French fleet, but Jervis's victory rendered this object unattainable. In conſequence of this memorable victory, Sir John was created earl St Vincent, and had an annuity of 2000l. ſettled upon him, receiving at the ſame time the thanks of both houſes of parliament.

483 A Dutch fleet defeated by Admiral Duncan off Camperdown.

The Dutch, if poſſible, were ſtill more unfortunate, Admiral Duncan having blocked up the Texel where their fleet lay, during the whole ſummer, with the aſſiſtance of which it appears that the French meant to try the fate of another attack upon Ireland. A reſolution having at length been adopted of riſking an engagement with the Britiſh at ſea, De Winter received poſitive orders to ſail, a ſtep againſt which he remonſtrated, but without effect. Admiral Duncan was at this time refitting at Yarmouth, but on receiving intelligence of the ſailing of the Dutch fleet, he ſet out in ſearch of, and came up with it on the 11th of October, conſiſting of a force rather inferior to his own fleet, which amounted to 16 ſail of the line and three frigates. The Britiſh admiral ran his fleet immediately through the Dutch line, commencing the attack between them and their own coaſt, about nine miles from Camperdown. As the Dutch are deſperate fighters by ſea, our readers will naturally conclude that this was a ſanguinary conflict. It laſted for three hours, at which time the greater part of the Dutch fleet had ſtruck; but owing to the ſhallowneſs of the water on the coaſt they could not all be ſeized. Eight ſhips of the line, two of 56 and one of 44 guns, were taken, beſides a frigate afterwards loſt near the coaſt of Britain. Admiral De Winter was captured with his ſhip, and

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Vice-admiral Rentjies. Admiral Duncan received honours ſimilar to thoſe which were beſtowed upon Earl St Vincent, and an annuity to the ſame amount.

484 Great diſturbances at Rome.

After the ratification of the treaty with the emperor at Campo Formio, Joſeph Bonaparte, one of the brothers of the general, was ſent to the city of Rome as plenipotentiary from the French republic. The pope having now no expectation of foreign aſſiſtance, ſubmitted to every demand for the reduction of his troops, and for emancipating every perſon confined in priſon on account of their political ſentiments. On the 26th of December 1797, three men waited upon the ambaſſador, and requeſted the co-operation of France in bringing about a revolution which a party at Rome was anxious to eſtabliſh. He rejected the propoſal, and did every thing in his power to diſſuade them from it; but he neglected to communicate the intelligence to the papal government, which was certainly his duty. He went to the ſecretary of ſtate on the 28th, and ſhewed him a liſt of perſons under his protection who had a legal authority to wear the French cockade, and conſented at the ſame time that all others wearing it ſhould be puniſhed. He offered to give up ſix of the inſurgents who had taken refuge in the palace. In the evening of the 28th a more ſerious tumult happened in the courts and vicinity of the French ambaſſador's palace, with which the pope, it is believed, was not perſonally acquainted; but the governor of the city endeavoured to diſperſe the inſurgents by parties of cavalry and infantry. General Duphot, in attempting to make the military deſiſt from firing upon the inſurgents, was ſhot by a petty officer belonging to the troops of his holineſs. The ambaſſador and his other friends now made their eſcape to the palace through a bye-way. The Spaniſh ambaſſador having been informed of this event, ſent to the ſecretary of ſtate, and proteſted againſt ſuch a daring violation of the privileges of plenipotentaries. The palace of the French ambaſſador was ſtill ſurrounded by the military, when at laſt he demanded paſſports to enable him to leave the territories of the pope, which were ſoon granted, and accompanied by many proteſtations of the innocence of government, and its ſorrow that ſuch an unfortunate event ſhould have taken place.

485 The continental powers decline aſſiſting the pope.

Joſeph Bonaparte went to Florence and from thence to Paris. The protection of Vienna, Spain, Naples, and Tuſcany was earneſtly ſolicited by the pope, but they all ſeemed diſpoſed to keep at a diſtance from his misfortunes. General Berthier experienced little or no oppoſition on his march to Rome, where he ſubverted the dominion of the pope, and proclaimed the ſovereignty of the Roman people, with too many marks of wanton, unprovoked inſult. The tree of liberty was planted on the very day on which the anniverſary of the pope's election to the ſovereignty was celebrated; intended, no doubt, to make him feel ſtill greater mortification. While in the Siſtine chapel receiving the congratulations of the cardinals, the commiſſioner general, and Cervoni, who commanded the troops within the city, during this ceremony entered the chapel, and announced to the ſovereign pontiff on his throne, that his reign was at an end. He was removed to the territory of Tuſcany, where he dwelt in great obſcurity, till his enemies being in their turn driven from Rome, were pleaſed to remove him farther from the capital, to terminate his exiſtence beyond the Alps.

The greateſt curioſities found in Rome were conveyed to Paris, and ſold by public auction, the directory having ſacrificed national vanity at the ſhrine of avarice. Paſsports were offered to the natives of countries at war with France, if they inclined to become purchaſers.

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486 Conqueſt of Switzerland reſolved on by the French.

But ſcenes of a different and ſanguinary nature were in the mean time exhibited in Switzerland, a country which had preſerved its neutrality during the conflict of France with the combined powers, thus defending the weakeſt part of her frontiers, and as a grateful return for paſt favours, it was now determined to ſubjugate Switzerland. About the end of the year 1797, an inſurrection broke out in the Pays de Vaud, ſubject to the canton of Berne, which made the government perceive its critical ſituation, and iſſue a proclamation on the 5th of January 1798, requiring the people of the Pays de Vaud to appear in arms, renew their oath of allegiance, and reform every exiſting abuſe. A commiſſion of the ſenate at Berne was empowered to examine every complaint, and redreſs every grievance; but their motions were conſidered as too tardy by popular impatience, and the inſurgents endeavoured to become maſters of the ſtrong places. Troops were ſent againſt them by the government of Berne, but General Weiſs acted with heſitation, if not even with treachery, and a body of republicans appeared under General Menard, who ſent an aid-de-camp and two huſſars to General Weiſs. As the meſſengers returned, one of the huſſars was killed, moſt probably by accident, but it was inſtantly magnified into a horrid breach of the law of nations. The French, therefore, continued to advance, and were maſters of the whole Pays de Vaud by the end of January. The government of Berne prepared for war, while it at the ſame time uſed every effort in order to maintain peace. A truce was entered into with General Brune, the ſucceſſor of Menard, and thoſe who killed the huſſar were delivered up. An army of 20,000 men was collected, the command of which was given to M. d'Erlach, once a field marſhal in the ſervice of France. But there was a prevailing diſaffection in his army, and the people were far from being united among themſelves. With this circumſtance the French were well acquainted, and therefore they demanded a total change of government. As M. d'Erlach was apprehenſive of a ſtill greater defection in his army, he requeſted permiſſion to put an end to the armiſtice. The French now refuſed to negotiate, and General Schawenberg on the 2d of March took poſſeſſion of Soleure at the head of 13,000 men. Brune afterwards made himſelf maſter of Friburg, and forced the Swiſs army to retreat. The government of Berne being now greatly alarmed, decreed the *landſthurm*, or riſing of the people in a maſs, which their ancient cuſtoms juſtified in the time of neceſſity. The people aſſembled, diſſolved the government, and offered to diſmiſs the army, if the republican troops would retire. This offer was rejected, without admitting a French garriſon into Berne, and therefore they continued to advance. About 6000 from the army of M. d'Erlach had deſerted, leaving him at the head of no more than 14,000 men; and although the riſing had abundantly ſupplied him with numbers, yet he had not time ſufficient to get them properly arranged. He was attacked on the 5th of March, and driven from Newenbeg and Fayenbrun,

France. 1798. Favenbrun, but having rallied his troops, he made a ſtand for ſome time at Uteren. The conflict was renewed at Grauholtz, from whence they were driven four miles nearer the capital. Being completely defeated, they murdered many of their officers in a fit of deſpair, among whom was their commander in chief. Berne capitulated to the French, which induced the more wealthy and populous ſtates to follow the example; but the poorer cantons made a dreadful effort to preſerve their ſmall poſſeſſions, and the independence of their country. They compelled Schawenberg to retire with the loſs of 3000 men, but were at laſt totally vanquiſhed by the ſuperior ſkill and numbers of the republican army. The public magazines were plundered, and a new conſtitution was forced upon them after the model of France.

If the directory made no ſcruple to violate the independence of other nations, it was very reaſonable to conclude that they would pay little regard to the liberties of their countrymen at home. A third of the legiſlature was changed in the month of April; one member of the directory went out by ballot, and Treilhard was choſen to ſucceed him. Nothing was left unattempted by the directory to influence the election in favour of their friends, but their ſucceſs was not great. They complained to the council of five hundred on the 2d of May; they complained of plots of royaliſts, by which it was ſaid that elections had been made to fall on men who were inimical to the intereſt of the republic. It was propoſed on the 7th by the committee who reported on the meſſage of the directory, that many electoral aſſemblies ſhould be annulled; but General Jourdan oppoſed this plan as incompatible with the freedom of election, and as proceeding upon the ſuppoſition of conſpiracies which had no exiſtence.

487 The invaſion of Egypt projected by the directory.

We are now to be preſented with the moſt extravagant project which perhaps the directory ever attempted to execute;—to ſend a formidable army to take poſſeſſion of Egypt, and from thence to proceed by the Red ſea to the Eaſt Indies, to take poſſeſſion of the Britiſh ſettlements in that quarter of the globe. After peace was proclaimed between France and Germany, the directory made no ſecret of their determination to invade Great Britain. Whether this project was of Bonaparte's own deviſing, or intended as a ſnare in order to get rid of him and his victorious army, ſeems to be a matter which our readers muſt be left to determine for themſelves. It might not be his project, and he might accept the command of the army of Egypt from this conviction, that he would be ſafer abroad in the moſt perilous undertaking, than be expoſed at home to the malice of a government become jealous of his reputation, and which was far from being ſcrupulous of its conduct.

The meditated attack upon Egypt was certainly conducted with ſuch a decree of ſecrecy as was calculated to miſlead. Prodigious ſtories were circulated concerning large rafts of timber, by means of which the *army of England*, as it was called, was to be conveyed over to Britain; and to give the greater probability to this report, General Bonaparte, the commander in chief, made a journey to the weſtern coaſt. The fleet was getting ready in the harbour of Toulon, and troops were collected in its vicinity. But Bonaparte embarked with 40,000 of his veteran troops, and on the 9th of June reached the iſland of Malta. He quarrelled with the grand-maſter, France. 1798. becauſe he would not permit ſo large a fleet to water all at once in his ports. The French commander landed his troops in different places, and attempted to make himſelf maſter of the iſland. It is ſaid that many of the knights belonged to the illuminati, and were therefore ready to betray their government. After a very feeble oppoſition the grand-maſter capitulated, and thus gave up in a few days a fortreſs which, it is ſaid, might have held out for weeks againſt all the troops of the French republic. Bonaparte left in the iſland a garriſon of 4000 men, and ſailed for Alexandria on the 21ſt.

488 Admiral Nelſon goes in ſearch of Bonaparte.

Rear-admiral Nelſon having diſtinguiſhed himſelf in a very eminent degree, while in the ſtation of commodore under Lord St Vincent, was ſent in purſuit of Bonaparte. Being wholly ignorant of the deſtination of the French, he ſailed for Naples, where he obtained information of the attack upon Malta, to which accordingly he ſteered his courſe. On his arrival, however, he found that Bonaparte was gone; but conjecturing that he had ſailed for Alexandria, he immediately prepared to follow him. The French commander, inſtead of keeping a direct courſe towards that city, ſtood along the Grecian coaſt, till he made the eaſternmoſt point of the iſland of Candia. Then ſteering to the ſouthward, he ſo protracted his voyage, that he did not reach the Egyptian coaſt till Admiral Nelſon had left it. Having landed his troops, he took the city of Alexandria by ſtorm on the 5th of July. It was deſperately defended by the inhabitants, but without military ſkill. The republican tranſports were drawn up within the inner harbour of Alexandria, and the ſhips of war caſt anchor along the ſhore of the bay of Aboukir. The republican army marched on towards the Nile, and in proceeding along the banks of that river, they ſuffered much from the intenſe heat of the climate. They ſoon came to action with the Mamelukes, or military rulers of the country; but the ſmall degree of ſkill poſſeſſed by thoſe barbarians, was by no means a match for European tactics. Cairo ſurrendered on the 23d, and two days after, another battle was fought, in which the inhabitants were defeated. They made a laſt effort on the 26th, near the celebrated pyramids, when 2000 of them were killed, 400 camels with baggage were taken, and 50 pieces of cannon.

489 Tyranny and duplicity of Bonaparte.

Having proceeded thus far in his conqueſt of Egypt, Bonaparte framed for it a proviſional government, and iſſued proclamations in the Arabian language, proteſting that the French were friendly to the religion of Mahomet, owned the authority of the grand ſignior, and were only come to inflict puniſhment on the Mamelukes for doing ſo much injury to their trade with Egypt. Thus far the good fortune of Bonaparte ſeemed ſtill to attend him; but on the 1ſt of Auguſt the fleet under Admiral Nelſon appeared off the mouth of the Nile, who having diſcovered the poſition of the French fleet, prepared to attack it. In point of numbers the two fleets were upon a level, but as to weight of metal the French fleet was the ſtronger of the two. Admiral Nelſon, by running ſome of his ſhips between the enemy and the land, ſurrounded one part of the fleet, while the reſt were thus rendered entirely uſeleſs. The Culloden ran aground while this plan was carrying into effect; an advantage upon the whole, as it pointed out to the reſt where the danger lay concealed. This memorable

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morable action commenced with the ſetting of the ſun, and continued, with occaſional intervals, till the break of day. Nine ſail of the line belonging to the French were taken; a ſhip of the line was burnt by her own commander, and the admiral's flag ſhip, L'Orient, was blown up during the action, few of her crew, conſiſting of 1000 men, having eſcaped deſtruction. Two ſhips of the line and two frigates were ſaved by flight, but afterwards captured.

490 Battle of the Nile.

If we confine ourſelves to modern times, it will be difficult to point out any naval engagement productive of more intereſting effects than this. The military exertions of France had by degrees deſtroyed the combination which the princes of Europe formed againſt her. The victories of Bonaparte had humbled the pride of Auſtria; the continent looked with diſmay towards the new republic, and when the directory ſeized on Rome and Switzerland, no power ventured to interpoſe in their behalf. The aſpect of affairs, however, had now undergone an almoſt total revolution. The once triumphant Bonaparte was ſhut up in a barbarous country, from which the fleets of Britain might prevent his return. Propoſals were made by Great Britain to the northern powers, for the recommencement of hoſtilities againſt France, as it was not conceived poſſible that ſhe could make ſuch reſiſtance as formerly. The ſtates of Italy, too, determined to make a bold effort for the recovery of their independence. The court of Naples rejoiced at the deſtruction of the French fleet, and the king himſelf went to meet Admiral Nelſon on his return from the Nile.

491 General Humbert invades Ireland.

It is well known that the French had long promiſed encouragement to the Iriſh rebels; but as their expectations were not gratified in time, they broke out into open rebellion without the promiſed aſſiſtance; and when the ſpirit of rebellion was almoſt wholly ſubdued, the directory attempted to land troops in ſmall diviſions, ſuch as that under General Humbert on the 22d of Auguſt, conſiſting only of 1100 men, who landed at Killala. Yet this force, ſmall as it was, would have proved formidable but a month before. They were joined by a party of the moſt deſperate of the rebels in the vicinity, and defeated General Lake at the head of a ſuperior force, taking from him ſix pieces of cannon. Their next ſtep was to march in different directions to announce the arrival of the republicans, and maintained their ground for three weeks. This able general receiving no reinforcements from France, finding the rebellion in a great meaſure cruſhed, and being informed that General Cornwallis was about to ſurround him with 25,000 men, he laid down his arms to a Britiſh column, four days after he had diſmiſſed his Iriſh aſſociates, that they might provide for their own ſafety. Active meaſures were now taken by the directory to ſend troops to Ireland when too late, as the vigilance of Britiſh cruizers defeated all their endeavours. La Hoche, a ſhip of 84 guns, and four frigates, were captured by Sir John Borlaſe Warren on the 12th of October, in attempting to reach Ireland with 3000 men. On the 20th another frigate was taken, deſtined for the ſame country, which induced the directory to abandon the attempt as altogether deſperate.

492 Imprudent conduct of the king of Naples.

The victory obtained by Admiral Nelſon at the mouth of the Nile, made the king of Naples act the very imprudent part of preparing to commence hoſtilities againſt France. Without even waiting till the Auſtrians ſhould commence the attack on the republican troops in the Roman territory, he procured General Mack to aſſume the command of his army. He began the war without any foreign aid, except the Britiſh fleet, and thus brought upon himſelf the vengeance of the French republic. The directory had no idea that he would adopt ſuch conduct, and of conſequence when General Mack appeared at the head of 45,000 men, the troops of France in that quarter were unable to contend with him. General Championet having juſtly complained of the attack made upon his poſts, circumſtanced as he was, he received for anſwer from the hoſtile commander, that his majeſty had reſolved to take poſſeſſion of the Roman territory, and adviſed the French to retire quietly into the Ciſalpine ſtates, maintaining that their entrance into Tuſcany would be conſidered as a declaration of war. Championet accordingly evacuated Rome, as he had no force againſt ſuch a formidable army. He left a garriſon in the caſtle of St Angelo, and concentrated what troops he could collect in the northern parts of the Roman ſtate. General Mack entered the city of Rome without oppoſition in the end of November.

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493 The French declare war againſt Naples and Sardinia.

Theſe tranſactions having been known at Paris, war was immediately declared againſt their Neapolitan and Sardinian majeſties, the latter of whom had committed no act of hoſtility againſt the French; but he was accuſed of diſaffection to the republic, a charge which could ſcarcely fail to be true. He found himſelf placed in a very humiliating ſituation ſince the firſt entrance of Bonaparte into Italy, his ſtrongeſt fortreſſes being in poſſeſſion of the French, who levied on him what contributions they thought proper, and even placed a garriſon in his metropolis. Being unable to go to war, he made a voluntary ſurrender of his continental dominions, and agreed to retire to the iſland of Sardinia.

A period was ſoon put to the diſpute with Naples. As the French retreated, the country people gave them much trouble and uneaſineſs, and the Neapolitan troops ſcarcely obſerved the modern rules of war reſpecting ſuch as they had taken priſoners. When General Bouchard, by orders from General Mack, commanded the caſtle of St Angelo to ſurrender, he maintained that he would view the priſoners in the light of hoſtages for the conduct of the garriſon, and that a man ſhould be put to death for every gun fired from the caſtle. It is ſcarcely to be imagined that the Neapolitan officers would have expreſſed themſelves in ſuch a ſhocking manner, if they had not calculated on the vigorous cooperation of the Auſtrian forces, in which, however, they were very much deceived. The conſequence was, that the territory of Naples very ſoon fell into the hands of the French. Either the terror of the republican name was ſo great in Italy, or the cowardice of the Neapolitan troops, that they were defeated by one-fourth of their own numbers, at Terni, Porto Fermo, Civita Caſtellana, Otricoli, and Calvi. As the army of General Mack was gradually reduced to 12,000 men, in conſequence of deſertion and frequent defeats, he adviſed the king of Naples and his family to take refuge on board the Britiſh fleet, which was then lying at Leghorn. This advice was adopted, and they reached Palermo in Sicily on the 27th of December, in Admiral Nelſon's ſhip. General Mack having requeſted an armiſtice,

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miſtice, it was refuſed by the French commander. Being driven from Capua, the only remaining poſt of any conſequence in the territory of Naples, and being in the greateſt danger from the diſaffection of his troops, he ſurrendered himſelf and the officers of his ſtaff to the republican general. The governor of Naples offered a contribution of money if the French troops would not enter that city, which was agreed to, and they remained at Capua. General Serrurier, at the head of a French column, drove the Neapolitans out of Leghorn, and took poſſeſſion of that place.

494 Deſperate conduct of the Lazzaroni.

Such is the mildneſs of the climate in the ſouthern parts of Italy, that the people can ſubſiſt with fewer efforts of induſtry than in almoſt any other country of Europe. This naturally begets an indolent diſpoſition, which is cheriſhed by a number of charitable inſtitutions originating from the Catholic religion. In Naples there had long been a body of men called Lazzaroni, or beggars, amounting to the aſtoniſhing ſum total of near 40,000, who entirely ſubſiſted on charity. They frequently threatened the ſtate if they did not receive an immediate ſupply of their wants, which procured them very liberal contributions. Having been informed that the French, wherever they came, deſtroyed all monaſteries and other ſources of charity, they determined to oppoſe them to the utmoſt of their power, and appear the advocates for royal government. In the beginning of January 1799, they exhibited marks of diſcontent, and at laſt broke out into an open inſurrection. They appointed Prince Militorni their commander in chief, who made many fruitleſs efforts to reſtrain their violence and love of plunder. They declared war againſt the French, forced the priſons open, and murdered all who had been incarcerated for diſaffection to the kingly government. Their ravages now became ſo dreadful and boundleſs, that Prince Militorni abandoned them, ſet out to Capua, and requeſted Championet to take poſſeſſion of the city, in order to reſcue it from utter deſtruction. It was agreed that a column of French troops ſhould take a circuitous route, and enter the city from the oppoſite quarter. Before this plan could be carried into execution, two-thirds of the Lazzaroni marched out on the 19th and 20th of January, with the daring reſolution to attack the French in the fortifications of Capua. Multitudes of them periſhed by the French artillery; and in order to favour the capture of Naples by the party ſent on that expedition, Championet made no ſally out upon them, but continued on the defenſive. The Lazzaroni being informed on the 21ſt that a French column had marched for Naples, returned to the city; and although Championet cloſely purſued them, they arrived in time to barricade the ſtreets, and prepare for the defence of different quarters. A terrible conflict now commenced, which laſted from the morning of the 22d to the evening of the 23d of January. Having been driven from ſtreet to ſtreet, they finally rallied at one of the gates of the city, where they were almoſt totally cut off. It is certainly a reproach to the Neapolitan government, not to have been able to give a better direction to the undaunted courage of ſuch men.

495 The directory becomes juſtly unpopular.

We may view this triumph as the laſt which the directory enjoyed, for the conſequences of their paſt conduct were now rapidly gathering around them. They were with the greateſt juſtice unpopular at home, both from their mode of conducting public affairs, and their repeated violations of the conſtitution of their country. Their profuſion was unlimited, as well as the exorbitant demands which they made upon conquered countries. Championet was ſo aſhamed of them, that in Italy he endeavoured to reſtrain them, in conſequence of which he was deprived of his command, and thrown into priſon; Scherer, the war miniſter, being appointed his ſucceſſor. Under him the rapacity of the government agents, and the embezzlement of the public ſtores, were carried as high as poſſible. Yet France ſtill continued to be dreaded by foreign nations, to whom the true ſtate of internal affairs was but obſcurely known. An army of 45,000 Ruſſians had arrived to the aſſiſtance of Auſtria, yet that cabinet was at a loſs whether to declare war or not. Britain ſolicited the aid of Pruſſia with an offer of large ſubſidies; but Sieyes, the plenipotentiary at Berlin, artfully contrived to defeat the negotiation, and counteract the unpopularity of his country in Germany, by giving to the world the ſecret convention of Campo Formio. This determined the greater number of the German princes to maintain their neutrality under the guardianſhip of Pruſſia.

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A note was preſented to the congreſs at Raſtadt on the 2d of January by the French plenipotentiaries reſident there, intimating that if the entrance of Ruſſian troops into Germany was not prevented, it would be conſidered as tantamount to a declaration of war. To this no ſatisfactory anſwer was returned. The ſtrong fortreſs of Ehrenbreitſtein ſurrendered on the 26th of that month, after being blockaded ſince the treaty of Campo Formio. This poſſeſſion, together with Mentz and Duſſeldorf, made the French a very powerful enemy on the Rhine. Switzerland alſo belonged to them, and all the fortified places of Italy, on which account they were qualified to commence active operations. At this period Jourdan commanded on the Upper Rhine from Mentz to Huningen; the eaſtern frontier of Switzerland was occupied by General Maſſena; Scherer had the chief command in Italy; Moreau acted under him, and Macdonald commanded the troops in the territory of Rome and Naples. Yet all theſe armies ſo ſcattered, did not exceed 170,000 men, a force greatly inferior to that of Auſtria, altogether independent of the Ruſſian army. The directory, however, truſting to the unity of its own plans, the wavering politics of the court of Vienna, and the ſlow movements of the imperial armies, was anxious to renew the war, a declaration of which againſt the emperor of Germany and the grand duke of Tuſcany, was made on the 13th of March. Jourdan had actually croſſed the Rhine at Straſburg on the 1ſt of that month, and occupied many ſtrong poſitions in Swabia. Manheim was taken, and General Bernadotte ſummoned Philipſburg to ſurrender, while General St Cyr entered Stutgard. In order to oppoſe the march of this army, the archduke Charles croſſed the Lech on the 4th of March; Maſſena marched into the territory of the Griſons, and ſurpriſing a ſtrong body of Auſtrians, made the whole of them priſoners, together with their general and the whole of his ſtaff, in conſequence of which the country of the Griſons was reduced.

496 War declared againſt the emperor and grand duke of Tuſcany.

The republican plan of procedure was not completed without the junction of Maſſena's and Jourdan's armies, to accompliſh which it was neceſſary to carry the important

France. 1799. portant poſt of Feldkirch, which was held by General Hotze. Defeated in his firſt attempt, Maſſena renewed the attack five times with freſh forces, but the determined bravery of the Auſtrians rendered them ineffectual. But as the French were in poſſeſſion of the Griſons, the invaſion of the Engadine was facilitated, where the Auſtrians being too weak to reſiſt, retreated into the Tyrol, and were purſued by the republicans, who forced ſome of the defiles, and extended their inroads as far as Glurentz and Nauders.

The vanguard of the principal Auſtrian army puſhed on to meet the French. It was attacked by Jourdan on the 20th of March, by whom the outpoſts were driven in; but the centre of his army was attacked on the following day, and forced to retire to Stockach during the night. The archduke encamped before Stockach on the 24th, and the republicans attacked him on the following day. His right wing under General Meerfeldt was their main object, which they ſucceeded in driving into a wood between Liptingen and Stockach. Meerfeldt renewed the conflict without ſucceſs. The left wing having maintained its ground, ſent reinforcements to General Meerfeldt, who in his turn obliged the French to retire. The French, however, made 4000 priſoners during the various movements of the day. Yet their loſs was ſo great, and the Auſtrian force ſo vaſtly ſuperior to their own, that General Jourdan durſt not hazard another engagement. He retreated on the following day, and feeling that he was not a match for the enemy, he ſent a part of his army to cover Kehl and Straſburg, and marched with the remainder towards Switzerland. By this event General Maſſena, who was forcing his way to the Tyrol and Engadine, was obliged to return to the protection of Switzerland. He was appointed to the chief command in this quarter, and Jourdan was removed.

497 Succeſs of the Auſtrians in Italy. The Auſtrians were no leſs ſucceſsful in Italy, notwithſtanding they were attacked by the French before the termination of the armiſtice. General Kray obtained a complete victory over them at Legnago, and forced them to flee for protection under the walls of Mantua. On the 15th of April they were again attacked by the Auſtrians at Memmuolo, and again forced to retreat after an obſtinate reſiſtance. The loſs ſuſtained by the French in theſe different engagements was unqueſtionably great, but we ſhould apprehend that the account which ſtates it at 30,000 men in killed, wounded and priſoners, muſt ſurely be exaggerated. But the Auſtrians may be ſaid to have purchaſed theſe victories at a dear rate. Scherer at firſt gained ſome advantages over them, but he had not ſkill to improve them, elſe they would have unqueſtionably given a new turn to the aſpect of affairs. The Auſtrian poſts were forced by a diviſion of his army on the 26th of March, and 4000 priſoners taken; but on the other diviſion being repulſed, he withdrew his troops, and thus relinquiſhed the advantages he had obtained. On the 5th of April the diviſion under Moreau performed wonders, and took 3000 priſoners; but by the unſkilful meaſures of Scherer, he was not ſupported, and the triumph of the Auſtrians was of courſe complete.

498 The Ruſſians and imperialiſts united under Suwarrow. Prior to this period, a body of Ruſſians joined the imperialiſts, and the command of this combined army was given to Field-marſhal Suwarrow Rimniſki, who advanced towards the Adda on the 24th of April; and after carrying the outpoſts of General Moreau, Suwarrow determined to attack him in his entrenchments. He maintained the appearance of attack along the whole line of Moreau, while he ſecretly threw a bridge over among the rocks at the upper part of the river, where ſuch a thing had been conſidered as impoſſible. By means of this bridge a part of the combined army next morning turned the republican fortifications, and attacked their flank and rear, while the reſt of the army forced the paſſage of the river at different points. The French fought with their uſual intrepidity, but were ſoon driven from all their poſitions, and forced to retreat to Pavia, with the loſs of 6000 men killed, 5000 made priſoners, including four generals, and 80 pieces of cannon. France. 1799.

General Moreau now eſtabliſhed the poor remains of his army, amounting to 12,000 men, upon the Po, between Aleſſandria and Valentia. He forced, on the 11th of May, a body of Auſtrians to retreat, and took a number of them priſoners. On the 12th, about 7000 Ruſſians croſſed the Po at Baſignano, and marched on towards Pecetto, when Moreau fell upon them with fury; and they refuſing to lay down their arms, about 2000 of them were drowned in repaſſing the river, and a few were taken priſoners. On the advance of Suwarrow, General Moreau was under the neceſſity of retiring to occupy the Bochetta, as well as other paſſes which lead to the territory of Genoa, when the combined army began the ſieges of the fortified places in Italy then occupied by the French. Bellegarde drove the French from the Engadine; Maſſena was obliged to retire to the vicinity of Zurich, he was ſo preſſed by the archduke; and nearly the whole of Piedmont had riſen againſt the republicans. They received no reinforcements from the interior of France, and their officers were obliged to act on the defenſive, to defend the frontiers as long as poſſible. In one inſtance only they had the power of making offenſive war, and it was certainly done with great vigour. General Macdonald had ſtill a conſiderable army in the ſouthern parts of Italy, in the territories of Naples and Rome. The combined powers had made no effort to cut off his retreat, convinced, perhaps that this could ſcarcely be accompliſhed in the mountainous countries of Tuſcany and Genoa. Knowing his ſituation to be ſecure, he was in no hurry to remove, although nearly the whole country between him and France was occupied by the combined army. His army amounted to about 30,000 men, and he received orders from the directory to leave the territories of Rome and Naples, and unite, if poſſible, with the army of Moreau. From the ſituation of the allies, however, he reſolved to hazard an action by himſelf. With Moreau he had concerted a plan for dividing their enemies, and vanquiſhing them in detail, as Bonaparte had ſo often done in Italy before. Macdonald alone was in a ſituation for ſtriking an important blow, yet it was neceſſary for Moreau to draw upon himſelf as many of the Auſtro-Ruſſian forces as poſſible, that the remainder might be more completely expoſed to the attack of Macdonald.

497 Artful ſtratagem of Moreau. Moreau availed himſelf of the circumſtance of the French and Spaniſh fleets being in the vicinity of Genoa, to ſpread a report that they had brought him a very powerful reinforcement, intending thereby to withdraw the attention of Suwarrow from Macdonald. The Ruſſian

France. 1799. Ruſſian general was at Turin, his advanced poſts at Suſa, Pignerol, and the Col d'Aſſiette, while General Hohenzollern was ſtationed at Modena with a conſiderable force, and General Ott at Reggio with 10,000 men. General Macdonald began his operations on the 12th of June, when his advanced diviſions attacked and defeated Hohenzollern, taking 2000 of his men priſoners. General Ott was attacked at the ſame time, and being compelled to retreat, the French made their entry into Parma on the 14th. He was again attacked on the 17th, and forced to retire towards Giovanni, where the progreſs of General Macdonald was arreſted.

498 The French defeated by Suwarrow. Suwarrow having received information of his approach, and of his ſucceſſes, left Turin on the 15th of June, at the head of 20,000 men, and came up with Macdonald on the banks of the Tidone. The centre and right wing of Suwarrow's army were commanded by Roſenberg and Foerſter, the Auſtrian general Melas commanded the left wing; Prince Procration was at the head of the advanced guard, and Prince Lichtenſtein of the reſerve. An action immediately commenced, which was fought with deſperate fury on both ſides for three ſucceſſive days, when victory declared in favour of Suwarrow. Driven from Tidone to the Trebbia, the French were finally vanquiſhed on the 19th, after a greater ſlaughter on both ſides than the oldeſt officer preſent recollected to have witneſſed. Victory remained doubtful, till General Kray arrived with large reinforcements from the army beſieging Mantua, and, in direct contempt of his orders, decided the fate of the day.

The republicans retreated during the night, and the next day they were purſued by the army of Suwarrow in two columns. Seldom could the French be overtaken in a march, but the army of Suwarrow accompliſhed this, when he ſurrounded the rear-guard of the fugitives, and obliged them to lay down their arms. The reſt of the army defended themſelves in the paſſes of the Appenines and territory of Genoa, after loſing, it is ſaid, no fewer than 17,000 in killed, wounded, and priſoners. Moreau, in the mean time, gave battle to the Auſtrians under Bellegarde, and though far ſuperior to him in numbers, they were totally defeated. This temporary advantage, however, availed little, in conſequence of the rapid return of Suwarrow from the purſuit of Macdonald. The fortreſſes in Italy ſurrendered in cloſe ſucceſſion, and it appeared as if the combined powers would ſoon be able to enter the territory of France.

The affairs of the republic became equally critical in Paleſtine. After having defeated the Mamelukes, made himſelf maſter of Alexandria and Cairo, and avowed himſelf a Mahometan in Egypt, Bonaparte led an army into Paleſtine, to take poſſeſſion of Jeruſalem, and by rebuilding the temple, and reſtoring the Jews, to give the lie to the prophecies of the Chriſtian religion. At the head of 10,000 men, with officers eminently ſkilled in the art of war, he reached the town of Acre on the ſea-coaſt, 28 miles ſouth of Tyre, and 37 north of Jeruſalem. He laid ſiege to this town in due form, which was but indifferently fortified, and defended by a ſmall garriſon of Muſſulmans, which the governor would have unconditionally ſurrendered, had he not been adviſed to make a vigorous reſiſtance by an Engliſh naval officer. Sir Sidney Smith having received the command of the garriſon, detained Bonaparte before Acre 69 days, although the number of the allies by whom it was defended did not exceed 2000 men. The French commander made eleven attempts to carry it by aſſault, all of which proved unſucceſsful. He was at laſt obliged to raiſe the ſiege, after he had loſt eight of his generals, 85 inferior officers, and almoſt one half of his army. His unſucceſsful attempt upon Acre muſt indeed appear important, eſpecially to Britain, if it be true that the Druſes, to the number of 60,000 men, had promiſed to join him on the reduction of that town. Had this junction been effected, it is believed that Conſtantinople would have become their prey, which was firſt to have been plundered, and then reduced to aſhes.

499 Fruitleſs ſiege of Acre by Bonaparte.

France. 1799.

While France experienced ſuch reverſes abroad, ſhe was much diſturbed alſo by internal commotions, and the directory found itſelf in a very critical ſituation. New elections were ſtill unfriendly to their intereſt, and they could no longer ſecure a majority in the councils, they were ſunk into ſuch contempt. When they ſought money, they obtained reproaches on account of their own profuſion, and the agents they employed. Inſurrections in the weſt and ſouth were formed by the friends of royalty, and theſe were with difficulty ſubdued, on account of the abſence of the military. In the midſt of all theſe difficulties, the occurrence of one event ſeemed to promiſe the directory the return of their former influence. On the 28th of April, the French plenipotentiaries received orders to quit Raſtadt in 24 hours. Having demanded a paſſport from Colonel Barbaſey, they received for anſwer that none could grant it but the commander in chief. They at laſt began their journey, the three miniſters, Bonnier, Roberjot, and Jean Debry, were in ſeparate carriages, Roberjot having his wife, and Jean Debry his wife and daughters along with him, attended by the miniſters of the Ciſalpine republic. At a ſhort diſtance from Raſtadt they were met by 50 Auſtrian huſſars, who ſtopped the carriage of Jean Debry, and demanded his name. Of this he informed them, adding that he was a French miniſter returning to France. He was immediately torn from his carriage, deſperately wounded with ſabres, and thrown into a ditch for dead. Bonnier and Roberjot were murdered on the ſpot. When the ruffians departed, and the carriages returned to Raſtadt, Jean Debry wandered all night in the woods, and next day returned to Raſtadt. He demanded the reſtitution of the papers which the *hired* aſſaſſins had carried off when they plundered the carriages, but they were refuſed. Raſtadt and its vicinity was occupied by French troops during the long ſitting of congreſs, of which the Auſtrians had obtained poſſeſſion but a few days before. The diſcipline, therefore, of the Auſtrian army was ſeverely reproached by this event; but it is probable that more than the want of ſubordination was at the bottom of a crime ſo atrocious, unprecedented, and totally repugnant to the laws of nations. It is true, the archduke loſt no time to declare his utter ignorance of the matter in a letter to Maſſena; but this was far from giving ſatisfacton to the French directory. In a meſſage to the councils on

500 The directory ſinks into contempt.

501 Murder of the French ambaſſadors at Raſtadt.

France. 1799.

the 5th of May, they made it the premeditated act of the Auſtrian government, to inſult France by the murder of her ambaſſadors.

502 Sieyes choſen a member of the directory.

A violent oppoſition to the directory commenced by the introduction of the new third of this year. Sieyes, who was ambaſſador at Berlin, and had poſſeſſed conſiderable influence over all parties, was elected a member of the directory. This ſtation, we have already ſeen, he refuſed to occupy at the firſt eſtabliſhment of the conſtitution, and therefore his acceptance of it at ſuch a critical juncture, excited great ſurpriſe. Treilhard was removed from the directory, as it was ſaid that he had held an office in the ſtate within leſs than a year previous to his election. Merlin and Reveillere were under the neceſſity of reſigning, to avoid an impeachment which was threatened to be brought againſt them; but Barras ſtill retained his ſtation. Moulins, Gohier, and Ducos, men who were but very little known, and, far from being leaders of the contending parties, were choſen members of the directory. The public ſpirit was attempted to be revived by the eſtabliſhment of clubs, a liberty of which the reſtleſs Jacobins firſt took advantage. They ſoon propoſed violent meaſures, and began to denounce the members and the conduct of government. But their intemperance having juſtly alarmed the directory, they obtained permiſſion from the councils to ſuppreſs their meetings, before they had time to corrupt the public mind.

503 General Joubert is killed, and the French retreat under Moreau.

The directory now employed every effort to augment the armies which had lately ſuffered ſuch dreadful diminutions. In the beginning of Auguſt their army in Italy amounted to 45,000 men, of which General Joubert had the chief command. Turin, Aleſſandria, Milan, Peſchiera, and Ferrara, were captured by the allies with aſtoniſhing rapidity. Turin ſuſtained a bombardment of only three days, Aleſſandria held out ſeven, and Mantua only fourteen, in which laſt place there were 13,000, who were diſmiſſed on their parole. The combined powers next laid ſiege to Tortona, and General Joubert reſolved on its relief, which object he expected to accompliſh before the arrival of Kray with aſſiſtance to Suwarrow. The whole of the Auſtrian poſts were driven in by the republicans on the 13th of Auguſt, who took poſſeſſion of Novi. On the 15th they were attacked by Suwarrow, who by this time had received troops from Mantua under General Kray. The right wing was commanded by this officer, its left by Melas, and its centre by Prince Procration and Suwarrow in perſon. The engagement commenced about five o'clock in the morning, ſoon after which, while General Joubert was urging his troops forward to charge with the bayonet, he received a muſket ſhot in his body, and falling from his horſe, he immediately expired. Moreau reſumed the command, and after a bloody conflict, the allied army gave way in all directions. The Ruſſians in particular ſuffered ſeverely, from the obſtinate manner in which they fought. The French line was attacked at three in the afternoon, but remained unbroken; and the whole would have terminated in the defeat of the allies, if General Melas had not turned the right flank of the republican line; and following up his advantages, he got poſſeſſion of Novi, when the French army began to retreat under the command of General Moreau.

The Auſtrians ſay that the French upon this occaſion loſt 4000 men killed, and the ſame number taken priſoners, confeſſing that their own loſs was equal to this; but the loſs of the Ruſſians was never publiſhed. We have reaſon to believe that it was the greateſt of the whole, ſince they will rather ſtand and be cut to pieces than think of retreating. The French loſt all hope of being able to defend Genoa, and therefore prepared to evacuate that city and territory. It was now the apprehenſion of the directory that the ſouth of France would immediately be invaded, but in this they were happily deceived. The conquered army was aſtoniſhed to find itſelf unmoleſted after ſo ſignal a defeat, and in a few days ventured to ſend back parties to reconnoitre the movements of the allies. Championet, the ſucceſſor of Joubert, was amazed to find that they had rather retreated than advanced, on which account he reſumed the poſitions held by his army before the battle of Novi.

France. 1799.

504 Suwarrow marches to the relief of Switzerland.

So far from proſecuting the advantages they had obtained in Italy, Suwarrow was perſuaded to abandon that country with his Ruſſian troops, and march to the deliverance of Switzerland from the yoke of France. The army of Maſſena in this quarter amounted to 70,000 men in the month of Auguſt, which not only prevented the archduke from purſuing his advantages, but the French even threatened to endanger his poſition. Maſſena's right wing under General Lecourbe had carried Mount St Gothard, the great paſs leading from the eaſtern parts of Switzerland into Italy. Suwarrow's expectations were no doubt high, having never yet been vanquiſhed, and being called upon to undertake an enterpriſe in which the Auſtrians had hitherto failed, even under their moſt fortunate general. When he was ready to march, the Auſtrian commander in Italy refuſed to give him mules for tranſporting his baggage. This officer had recourſe to a moſt pitiful falſehood, when he aſſerted that he would be furniſhed with a competent number at Bellinzone, where Suwarrow could find none. Having no other alternative, he diſmounted the cavalry, and made uſe of their horſes to drag along the baggage. In ſpite of theſe obſtacles, however, he arrived, by forced marches, on the frontiers of Switzerland on the day which he and the archduke had fixed upon.

Either ſuppoſing that it would demean a prince of the houſe of Auſtria to ſerve under a Ruſſian general, or not being daring enough to require the moſt experienced general in Europe to receive orders from ſo young a man as the archduke, that prince was ſent into Swabia to attack a ſmall body of republicans. He took with him 48,000, ſome ſay 60,000 men, although 20,000 would have been more than ſufficient for the accompliſhment of ſuch an undertaking. It is not an eaſy matter to conceive upon what principle the council of war at Vienna could imagine, that ſuch an able officer as Maſſena would continue inactive at the head of an army almoſt the double of that which was ſent to oppoſe him. The archduke marched againſt the French in Swabia, who reſiſted him as much as the ſmall number of their troops would permit; but they were gradually driven towards the Rhine. To carry on the deception, they made a ſerious ſtand in the vicinity of Manheim, where they loſt 1800 men, and which the Auſtrians entered, ſeemingly determined to croſs the Rhine.

Switzerland in the mean time was completely expoſed

France. 1799. posed to the army of Maſſena. The right wing of the combined army in this country was commanded by General Hotze; the centre, compoſed of the newly arrived Ruſſians, was headed by Korſakof; and the left wing by General Nauendorf. As ſoon as Maſſena underſtood that the archduke had entered Manheim, and that Suwarrow was approaching to Switzerland by the way of St Gothard, he began his movements. St Gothard was defended by Lecourbe, and in the mean time Maſſena determined to anticipate the arrival of Suwarrow. Having drawn the attention of the Ruſſians to another quarter on the 24th of September, by a falſe attack, he ſuddenly croſſed the Limmat, three leagues from Zurich. Some of the French troops engaged the Auſtrians, but the principal part of the army marched againſt the Ruſſians. General Hotze fell in the beginning of the action, and Petraſch who ſucceeded him ſhunned a total defeat, by retiring in the night with the loſs of 4000 men. The Ruſſians fought with very ſingular obſtinacy, being in a mountainous country to which they were ſtrangers, and fighting againſt the moſt able commanders in Europe. It was in vain, however, to attempt putting them to flight, for even when ſurrounded they would not lay down their arms, but ſtood to be ſlaughtered on the ſpot. The Auſtrians having retreated on the 25th, the Ruſſians on the 28th followed their example, retreating under General Korſakof in good order, and with the loſs of 3000 men, which was not very great, conſidering his perilous ſituation.

505 Suwarrow diſguſted with the conduct of Auſtria.

During theſe tranſactions, General Suwarrow was proceeding by the way of Italy with an army of 18,000, but others ſay no more than 15,000 men. He carried the paſs of St Gothard, and deſcended into the valley of Urſeren, driving Lecourbe before him with great ſlaughter, and advanced as far as Altorf. He next day reached the canton of Glaris, and made 1000 of the French priſoners, and General Linken defeated another corps of 1300 men. Maſſena now turned upon Suwarrow, and by ſurrounding him on all ſides, expected to take him and the grand duke Conſtantine priſoners. Suwarrow defended himſelf in a very maſterly manner, and there being only one paſs in the mountains unoccupied by the republicans, the aged hero diſcovered it, and by this he effected his eſcape, but loſt his cannon and baggage among the dreadful precipices with which that country abounds. He made his way through the Griſon country, and arrived at Coire with about 6000 men. Suwarrow felt truly indignant when he found in what manner affairs had been conducted, the perilous ſituation in which the Ruſſians had been left by the archduke, and the deſtruction which of conſequence they had met with. He conſidered himſelf and his men as treacherouſly betrayed, complained bitterly of the commander of the allies in Switzerland, and publicly charging the council of Vienna with ſelfiſhneſs and injuſtice, refuſed to co-operate farther with the Auſtrian army. He tranſmitted an account of the whole in a letter to Peterſburgh, and withdrew his forces to the vicinity of Augſburg to wait for further orders from his court.

506 Britain prepares to invade Holland.

Great Britain in the mean time made active preparations to invade Holland, with an army of 40,000 men, compoſed of Britiſh troops and auxiliaries from Ruſſia. The firſt diviſion under General Sir Ralph Abercromby ſailed in the month of Auguſt, protected by a fleet under Admiral Duncan. Bad weather prevented any attempt to land the troops till the 27th, on the morning of which day the debarkation was effected on the ſhore of Helder Point without oppoſition. They were not expected to land in North Holland, on which account the troops in that neighbourhood were few. But before the Britiſh troops had proceeded far on their march, they had to contend with a conſiderable body of infantry, cavalry, and artillery, haſtily collected from the adjacent towns. The Dutch fought with great obſtinacy, but became fatigued by the ſteady oppoſition of their antagoniſts, and fell back about two leagues. They evacuated the fort of Helder in the night, and it was taken poſſeſſion of by the Britiſh on the morning of the 28th. Admiral Mitchell now entered the Zuyder ſea with a detachment of the Britiſh fleet, in order to give battle to the Dutch under Admiral Story. Inſtead of retiring to the ſhallow water with which that ſea abounds, he unaccountably ſurrendered his whole fleet on the 30th of Auguſt without firing a gun, pretending that from the mutinous diſpoſition of his ſeamen, he could not prevail upon them to fight. France. 1799.

If this had terminated the expedition, it would have been extremely fortunate, as eſtabliſhing the power of the Britiſh fleet without a rival. But this victory, if it can be ſo called, was followed up by an endeavour to reſtore the authority of the ſtadtholder, and the ancient government of the United Provinces. As no more than the firſt diviſion had arrived, the terror of an invading foe began to be diſſipated, the enemies of the new government were diſheartened, and time was allowed to prepare for defence. But theſe were not the only errors chargeable on the expedition. The Britiſh troops landed in the very worſt place they could poſſibly have choſen, not only as it is everywhere interſected by ditches and canals, but it abounded more than any other part of Holland, with perſons diſaffected to the perſon and government of the ſtadtholder. In a word, this unfortunate expedition was undertaken towards the approach of the rainy ſeaſon, when a campaign in Holland is next to impoſſible. When it was firſt ſpoken of, even the French directory heſitated to undertake the defence of that country; but when the time and place of landing came to be known, they were ſoon determined, being almoſt certain of ſucceſs. General Brune was accordingly ſent with what troops could be ſpeedily collected, in order to co-operate with General Daendals. 507 Which is ill conducted.

General Abercromby in the mean time could only act on the defenſive, as no reinforcement had arrived. The enemy was encouraged by his want of activity, and ventured to attack him on the 10th of September. Two Dutch columns, and one of republicans, advanced upon him, but were repulſed in every direction, and forced to retreat to Alkmaer. Additional troops arrived on the 13th, under his royal highneſs the duke of York, who aſſumed the chief command. On the arrival of the Ruſſians, offenſive operations were immediately reſolved on, and the army advanced on the 19th. The left wing under General Abercromby marched along the ſhore of the Zuyder ſea to attack Hoorne; Generals Dundas and Pultney commanded the centre columns, and the Ruſſians were led on by their own general D'Herman. Owing to ſome miſunderſtanding, the Ruſſians advanced to attack the enemy

France. 1799.

about three o'clock in the morning, which was some hours before the rest of the army began its march. Their first efforts were crowned with success, and they made themselves masters of the village of Bergen; but as they pressed too eagerly forward without the co-operation of the other columns, the enemy nearly surrounded them. Their general was made prisoner; and notwithstanding the British troops came up in time to secure their retreat, they lost upwards of 3000 men. This defeat of the right wing made the commander in chief recal his troops from their advanced positions, notwithstanding General Abercromby was master of Hoorne and its garrison, and General Pultney had carried by assault the chief position of the Dutch army.

Such was the severity of the weather, that no fresh attack was made till the 2d of October, on which day a desperate action commenced between the British, and the united Dutch and French troops, at 6 o'clock in the morning, which did not terminate till the same hour at night when the British gained possession of Alkmaer and the neighbouring villages. This engagement having been chiefly carried on among the sand hills near the ocean, the fatigue which the troops endured, prevented them from gaining any great advantage over the fugitives, who took a position between Baverwyck and Wyck-op-zee, where the duke of York again attacked them on the 6th, and kept possession of the field after a very sanguinary contest. This, however, was the last success gained by the invading army. The duke of York finding that he could make no farther progress, the enemy having been so rapidly reinforced, the difficulties presented by the face of the country and the badness of the weather also conspiring against him, retired to Schager Brug, where he waited for orders from England relative to his return home. Being in the mean time closely pressed by the enemy, his embarkation must have been accomplished with great danger, had he not entered into a convention with the Dutch and French, that his retreat should not be molested farther, in return for which he promised not to injure the country by demolishing any of the dykes which defended it from the sea, and that Great Britain would restore to France and Holland 8000 prisoners taken before the present campaign.

The affairs of the French republic now began, in consequence of these events, to wear a more favourable aspect. It is true, Championet was defeated in Italy in all his efforts against the Austrians, and Ancona surrendered on the 13th of November to General Frolich; but the French were still masters of the Genoese territory, Switzerland and Holland, and the new combination formed against them seemed about to be dissolved. Prussia withdrew at an early period, and still preserved a neutrality; and from existing circumstances it was natural to conclude, that the emperor of Russia would also desert the cause of the allies.

508 The Turks defeated by Bonaparte near the Pyramids.

An event took place about this time which presented the revolution of France in a light never before seen. Our readers will recollect that General Bonaparte was obliged to retreat from Acre with great loss, after a siege of 69 days. At this time he received information that a Turkish army was about to invade Egypt by sea, and therefore he returned across the desert of Arabia by the way of Suez, and arrived in the vicinity of the Pyramids on the 11th of July, when an army of 18,000 Turks landed at Aboukir, which they carried by assault, and put the garrison to death, consisting of 500 men. Bonaparte marched down the country against them on the 15th, and ten days after came in sight of them at six o'clock in the morning. Their troops were divided into two parts, encamped on the opposite sides of a delightful plain. The cavalry of Bonaparte advanced with rapidity into the centre of the Turkish army, cutting off the communication between its different parts. Struck with terror, the Turks endeavoured to gain their ships, when the whole of them perished in the sea. The left division made a more obstinate resistance, but it was at length defeated. About the end of September the news of this victory reached France, which recalled the memory of Bonaparte's conquests, as forming a striking contrast to the reverses experienced by the republic after that period. The directory received a dispatch from him on the 10th of October, which was read to the councils; and on the 14th a message announced the arrival of Bonaparte in France, together with his principal officers. He was received at Paris with marks of distinction, although none could tell why he had left his army and returned home. At this time the parties in the government were equally balanced; and the assistance of Bonaparte was requested by both. The Jacobins were superior in the council of five hundred, and the Moderates in that of the Ancients. It was understood that Sieyes was attached to the latter party, on which account the Jacobins had made many unsuccessful efforts to dismiss him from his office. Intriguing as the Jacobins were, they were fairly outwitted by Sieyes, who had a plot ripe for execution, to overwhelm them in a moment. On the morning of the 9th of November, one of the committees of the council of Ancients gave in a report, that the country was in danger, proposing the fitting of the legislature to be adjourned to St Cloud, about six miles from Paris. The council of five hundred having no legal right to question the authority of this decree, and as the ruling party was clearly taken unawares, the members gave their silent consent, and both councils met at the place appointed on the 10th of November.

509 Who returns to France, and subverts the directorial government.

The council of five hundred received a letter from Lagarde, secretary to the directory, informing them that four of its members had resigned their offices, and that Barras was a prisoner by order of Bonaparte, whom the council of Ancients had appointed commander of their guard. In the midst of their deliberations, General Bonaparte entered the hall, accompanied by about 20 officers and grenadiers. He proceeded towards the chair where his brother Lucien sat as president, when great tumult ensued, and the epithets of a Cromwell, a Cæsar, and a usurper, were conferred upon him. The members pressed forward upon him, and Arena a Corsican endeavoured to dispatch him with a dagger; but he was rescued by his military attendants. A party of armed men entered the hall, and carried off the president, when in a violent debate which ensued, it was proposed that Bonaparte should be declared an outlaw. Military music was soon heard approaching; a body of armed troops entered the hall, and the members were obliged to disperse. The council of Ancients set aside the constitution, and passed a number of decrees. The directory was abolished, and an executive commission substituted in its place, consisting of Bonaparte, Sieyes, and

France. 1799. and Roger Ducos, under the denomination of conſuls. The ſittings were adjourned till the 20th of February 1800, and two committees, conſiſting of 21 members, choſen from both councils, to act as interim legiſlators. The greater part of the members compoſing the council of five hundred returned to Paris, having been expelled from the hall by the military, while part of them continued, and ſanctioned all the decrees of the council of ancients. On the 17th of November the conſuls decreed the tranſportation of a great number of Jacobins to Guiana, and caſt a number of them into priſon; but theſe decrees were ſoon after reverſed, and every thing aſſumed an air of tranquillity.

The expedition to Egypt was in the mean time unſucceſsful in every one of its objects. Tippoo Sultan, ſon and ſucceſſor to the celebrated Hyder Ally, ſovereign of the Myſore country, had, in the year 1792, been under the neceſſity of concluding a treaty of peace with Lord Cornwallis under the walls of Seringapatam, in which he reſigned a portion of his territory to the invaders, and agreed to pay a very conſiderable ſum of money. He was likewiſe obliged to deliver up two of his ſons as hoſtages for the punctual performance of every thing ſtipulated. A war which terminated in this manner could not reaſonably be expected to become the baſis of much cordiality. He was indeed obliged to ſubmit, but he only waited for a favourable opportunity to recover what he had loſt, and to accompliſh, if poſſible, the total expulſion of the Britiſh from India, which with him was a favourate object, as it had always been with his father. The aſcendancy of Britain, however, was now ſo great, chiefly owing to the exertions of Warren Haſtings, Eſq. that Tippoo clearly perceived the impoſſibility of ſhaking it, without the aſſiſtance of an army from Europe. To no country but France could he look for an adequate force; but the foreign and domeſtic wars ariſing from the revolution, had prevented the rulers of that nation from attending to the intereſts of diſtant regions. In 1797, Tippoo determined to renew his intercourſe with France by means of the iſlands of the Mauritius and Bourbon. One Ripaud, formerly a lieutenant in the French navy, who had reſided for ſome time at Seringapatam, perſuaded Tippoo that the French had a conſiderable force at the Mauritius, which with little difficulty might be ſent to his aſſiſtance. Ripaud being ſent to confer with the French upon the ſubject, he and two miniſters from Tippoo were joyfully received by Malartic the governor, and veſſels were ſent to France to acquaint the directory with their propoſals.

510 The motions of Tippoo Saib watched by Britain.

The governor Malartic in the mean time, either from groſs ignorance, from treachery, or a wiſh to involve Tippoo Sultan in a quarrel with Britain, adopted a meaſure which ultimately defeated the plans, and brought about the ruin of that prince. On the 30th of January 1798, he publiſhed a proclamation, containing the whole of Tippoo's confidential propoſals, inviting all citizens of France to eſpouſe his cauſe. Copies of this proclamation ſoon found their way into moſt quarters of the world. Accordingly the governor-general of India, received orders to watch the motions of Tippoo, and even hoſtilely attack him if it could not be prudently avoided. The Indian government, however, had, before this, been appriſed of the impending danger, and had made preparations for war without loſs of time.

But Tippoo did not place his ſole dependence on aſſiſtance from France. He invited one Zemaun Shah from the north-weſt, whoſe kingdom was compoſed of provinces taken from Perſia and India, to make an attack upon the Britiſh and their allies. In hopes of direct aid from France, which Tippoo expected in conſequence of Bonaparte's invaſion of Egypt, and the important ſervice which he looked for from the exertions of Zemaun Shah, he remained quiet, and endeavoured to temporiſe with the Britiſh. Military preparations on the part of the Britiſh being in a conſiderable degree of forwardneſs, Lord Mornington, the governor-general, informed Tippoo that he was not ignorant of his hoſtile deſigns, and of his connection with France, propoſing, however, to ſend an ambaſſador, for the purpoſe of bringing about a reconciliation. This was not anſwered till the 18th of December, although written by his lordſhip on the 8th of the preceding month. Tippoo ſimply denied the charge, and refuſed to admit the ambaſſador. Unwillingly to ſport with human blood, his lordſhip on the 9th of January 1799, again intreated Tippoo to receive the ambaſſador, to which no anſwer was returned during a whole month, during which interval 5000 men arrived from England, and General Harris received orders to advance at the head of the Madras army againſt the kingdom of Myſore. This ſeemed to bring Tippoo a little more to reaſon, who now offered to receive the ambaſſador, on condition he ſhould come without any attendance; but as this was not deemed a ſatisfactory conceſſion, the army continued to advance. An army from Bombay was alſo approaching on the oppoſite ſide of his dominions, which encountered part of Tippoo's forces, and defeated them; General Harris defeating the remainder of them on the 27th of March, who on the 7th of April ſat down before Seringapatam. This officer received a letter from Tippoo on the 9th, in which he mentioned his adherence to treaties, and wiſhed to be informed as to the cauſe of the war. The only anſwer he received was a reference to Lord Mornington's letters. He made another attempt on the 20th, and General Harris informed him that he had already been made acquainted with the only conditions which could or would be granted. The half of his dominions was to be ſurrendered, large ſums of money were expected from him; he was to admit an ambaſſador to his court, to diſclaim all connection with the French, and grant hoſtages for the faithful obſervance of every ſtipulation.

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511 Propoſals of Tippoo rejected.

Tippoo wrote a letter to General Harris on the 28th, deſiring leave to treat by ambaſſadors, which was refuſed him, as he was in poſſeſſion of the *ſine qua non* of the Britiſh government. It was believed that the beſieging army would have been obliged to retreat, had it been poſſible for Seringapatam to hold out only a fortnight longer. On the laſt day of April the beſiegers began to batter the walls of the city, and they got poſſeſſion of it on the 4th of May. Tippoo haſtened from his palace to the attack, when given to underſtand that a breach was made in the walls, where he fell undiſtinguiſhed in the general conflict. His treaſures and the plunder of the city were immenſe, with which the beſieging army was enriched, after deducting a certain proportion for the Britiſh government and the Eaſt India company. His ſubjects immediately ſurrendered, and

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and that part of the country which formed the ancient kingdom of Myſore, was conferred on a deſcendant of the former race of its kings, and the remaining territories were divided among the Britiſh and their allies. The family of Tippoo were either taken or made a voluntary ſurrender, being removed from that part of the country, and allowed a decent annuity.

Zemaun Shah in the mean time invaded the country from the north-weſt, advancing to the vicinity of Delhi, and ſpreading terror and deſolation wherever he came. Satisfied with plunder, however, he ſoon withdrew his forces; and the French army being detained in Egypt by a war with the Turks, as well as the want of ſhipping at Suez, Tippoo had to contend ſingly againſt the united force of Britain and her allies in thoſe eaſtern regions.

512 A conſular government eſtabliſhed in France.

The plan of a new conſtitution was preſented to the public by the conſuls in the month of December 1799. According to this plan, 80 men, who had the power of nominating their own ſucceſſors, and were called the conſervative ſenate, had likewiſe authority to elect the whole of the legiſlators and executive rulers of the ſtate, while none of theſe offices could be held by themſelves. One man, called the *chief conſul*, poſſeſſed the ſovereign authority, held his power for ten years, and was competent to be re-elected. Other two conſuls were to aſſiſt in his deliberations, but had no power to controul his will. The legiſlative power was divided into two aſſemblies; the tribunate, compoſed of 100 members, and the conſervative ſenate of 300. When the chief conſul thought proper to propoſe a law, the tribunate might debate upon it, without having authority to vote either for or againſt it, while the members of the ſenate might vote, but were not enabled to debate. The conſuls and the members of the legiſlative body, as well as of the conſervative ſenate, were not reſponſible for their conduct, but miniſters of ſtate employed by them were underſtood to be accountable. The committees which framed the conſtitution, nominated the perſons who were to execute the functions of government. Bonaparte was appointed chief conſul, and Cambaceres and Lebrun ſecond and third conſuls. Sieyes, as formerly, declined taking any active part in the adminiſtration of public affairs, and he received, as a gratuity for his ſervices, an eſtate belonging to the nation, called *Croſne*, in the department of the Seine and Oiſne.

513 Bonaparte propoſes to treat with Britain.

Bonaparte had not long been in poſſeſſion of the reins of government, till he ſent overtures for negotiating peace with the allied powers at war with France; but it is to be preſumed that he did not wiſh for a general peace. Separate propoſals were made to the different belligerent powers, no doubt with a view to diſſolve the coalition; but the decrees of the convention which declared war againſt all the powers of Europe, were not repealed by him. He departed from the forms ſanctioned by the cuſtom of nations in carrying on diplomatic correſpondence, but addreſſed a letter directly to his Britannic majeſty, the ſubſtance of which was contained in two queſtions; "whether the war, which had, for eight years, ravaged the four quarters of the globe, was to be eternal?" and "whether there were no means for Britain and France of coming to a good underſtanding?" Satisfactory, and we think, unanſwerable replies, were made to theſe queſtions by the Britiſh miniſtry, who dwelt much, and very juſtly, on the bad faith of revolutionary rulers, and the inſtability of the governments of France ſince the ſubverſion of monarchy. The overture tranſmitted to Vienna was of a ſimilar nature, and it experienced ſimilar treatment; but the emperor of Ruſſia abandoned the coalition, probably on account of the ſhameful manner in which Suwarrow had been treated, while carrying on the war in Italy and Switzerland.

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Bonaparte on the 7th of March ſent a meſſage to the legiſlative body, containing his own ideas of the conduct and deſigns of the Britiſh cabinet, and aſſuring them that he would invoke peace in the midſt of battles and triumphs, and ſwear to fight only for the happineſs of France and the repoſe of the world. This meſſage was followed by two decrees; the one calling, in the name of honour, upon every ſoldier abſent on leave from the armies of Italy and the Rhine, to join them before the 5th of April; and the other appointing a freſh army of reſerve of 60,000 men to be aſſembled at Dijon, under the immediate command of the firſt conſul.

About this time the belligerent powers were nearly ready for opening the campaign in Italy and on the Rhine. The Genoeſe republic was the only territory of any importance in Italy, which remained in the hands of the French, but the army by which they defended it was very much reduced ſince the preceding year, and might be conſidered as in a ſtate of mutiny, from the want of pay, clothes and proviſions. The Auſtrians eagerly wiſhed to obtain poſſeſſion of Genoa and all its dependencies, in which they could not fail to be ſeconded by the Genoeſe themſelves, as they looked upon the republicans to be the deſtroyers of their commerce. Maſſena received the command of the army in Genoa, with extraordinary powers, and evinced himſelf to be a general of conſummate abilities. Carrying a reinforcement of troops with him from Lyons and Marſeilles, and reducing to order and obedience, by a judicious diſtribution of rewards and puniſhments, all whom he found ready to deſert their ſtandards, he ſoon found himſelf at the head of a force ſufficient to check the progreſs of the Auſtrians, and keep the Genoeſe in ſubjection. After a number of battles had been fought, he was obliged to retire into the city, where he muſt ſoon have been compelled to ſurrender by famine, if General Melas had immediately blockaded it.

514 A Britiſh fleet appears off Genoa.

The appearance of the Britiſh fleet on the 5th of April, was the concerted ſignal for Melas to make an attack upon Genoa, the communication between which and France was thus cut off. Prior to the arrival of Lord Keith, a quantity of wheat and other proviſions had been thrown into the city, by which means the army and the inhabitants were reſcued from the conſequences of immediate famine. The ſurrounding country was ſoon vanquiſhed by the Auſtrians; but as the gallant Maſſena ſtill lived in the expectation of ſupplies from France, he obſtinately refuſed to ſurrender the city. General Melas having nothing to apprehend from this army blocked up in Genoa, left General Ott to continue the blockade, and went with his own forces againſt Sauchet, who commanded another diviſion of the French army.

A deciſive battle was fought between Ceva and St Lorenzo,

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515 The French defeated near Lorenzo.

Lorenzo, on the 7th of May, in which the republicans experienced a total defeat, having loſt 1200 priſoners, and 19 pieces of cannon. This ſoon obliged General Sauchet to abandon his ſtrong poſition of Col di Tenda, where he left behind him four pieces of cannon and 200 priſoners; and marching on towards Nice, the Auſtrians drove him from one poſt to another, till he was finally obliged to take refuge behind the Var; by which movements General Melas became maſter of the whole department of the Maritime Alps. But the campaign on the Rhine did not open in ſuch a favourable manner to the Auſtrians. The court of Vienna directed the archduke Charles to reſign the command of the army to General Kray, who diſtinguiſhed himſelf in ſuch an eminent manner in Italy, during the campaign of 1799. Of his military talents there could be only one opinion, and his integrity and zeal had been ſufficiently tried; but he had the misfortune not to be ſo *noble* as ſome of the other generals! It is truly ridiculous to behold men contending about trifles, when engaged in matters of ſuch vaſt importance as the ſalvation of their country. During the moſt propitious days of Rome, her greateſt generals were plebeians.

516 Moreau refuſes to act as directed by Bonaparte.

It could not be reaſonably expected that ſuch a diſcordant army, commanded by an able officer who had the misfortune not to be a *nobleman*, would ever be able to make head againſt the veterans of France, led on by ſuch an extraordinary general as Moreau. The Hungarian troops, finding themſelves ready to be ſacrificed to the party diſſenſions of their officers, would not fight againſt the enemy. The council of war at Vienna had ſent General Kray inſtructions at the opening of the campaign, how he was to diſpoſe of his forces, and having no general under him to ſupport his own opinion, he was under the painful neceſſity of obeying his inſtructions, whether he could approve of them or not. Inſtructions of a ſimilar nature had been tranſmitted to Moreau by the chief conſul, but he indignantly refuſed to fight under ſuch reſtraints. He was no doubt conſcious that his own knowledge of the military art was at leaſt equal to that of Bonaparte, while he was infinitely better acquainted with the country, and therefore he ſent a courier to Paris to acquaint the conſul, that if the orders ſent him were to be rigidly obeyed, he ſhould feel it his duty to reſign his command, and accept of an inferior ſtation. He accompanied his reſignation with a plan of the campaign which he had framed for himſelf, the propriety of which inſtantly ſtruck the chief conſul, and therefore he was ordered to carry on the war, according to his own judgement.

517 And is therefore left to his own judgement.

General Moreau being thus wiſely left to adopt and execute his own meaſures, croſſed the Rhine, and drove the Auſtrians from one poſt to another, till Kray, finding it impracticable to adopt offenſive meaſures with a rebellious army, with diſaffected officers to command them, reſolved to maintain his poſition at Ulm, and wait for aſſiſtance from Vienna. He was defeated at Stockach, Engen, and Moſkirch, although he exhibited fully the talents of an able general; but what talents were able to counteract the pernicious conſequences of treachery? At one time, when 7000 men received orders to advance, they inſtantly threw down their arms. Kray too plainly perceiving that it was abſolutely in vain to attempt any thing of an offenſive nature, entrenched himſelf ſtrongly at Ulm, commanding both ſides of the Danube, which makes it a place of great importance. Moreau perceiving his intentions, reſolved to try the paſſage of the Danube, and force him to a general engagement, by cutting him off from his magazines at Donawert. For this purpoſe he gave orders to Lecourbe with one of the wings of his army, to take poſſeſſion of a bridge between Donawert and Dillingen, which was not effected without conſiderable difficulty. The Auſtrians having perceived, when too late, that their all was in danger, diſputed every inch of ground with the French commander. Between the time of marching to, and of croſſing the Danube, Kray ſent reinforcements to the left bank to oppoſe the paſſage, in conſequence of which a battle was fought at Hochſtet, in the vicinity of Blenheim, where victory again declared for the French, who made 4000 of the enemy priſoners, independent of the killed and wounded loſt by the Auſtrians, of which we have ſeen no eſtimate.

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General Kray, ſenſible that his ſituation was perilous, left a ſtrong garriſon at Ulm, and marched againſt the enemy, attacking them at Newburg, which both ſides conducted with determined bravery; but the Auſtrians, after a long conteſt, fell back on Ingolſtadt. It may not improperly be ſaid, that this battle decided the fate of Germany. The electorate of Bavaria was now in the poſſeſſion of the French, with other territories of leſs extent; and as they approached the hereditary dominions of the emperor, men of republican ſentiments behaved with ſuch effrontery, as to convince the court, that no dependence could be reaſonably placed on armies compoſed of ſuch men. The imperial family, and the Britiſh ambaſſador, were openly inſulted in the theatre, and the cry of *peace*, *peace*, was vociferated from different quarters.

518 The French army at Dijon unexpectedly marches for Italy.

The ill ſucceſs of General Kray alone could not excite ſuch a ſpirit, becauſe at this time the affairs of Germany were even in a more deplorable ſtate in Italy than upon the Danube. When the campaign opened on the Rhine, the army of reſerve under the command of Bonaparte, which was formed at Dijon, began its march. When the French government declared that this army was above 50,000 ſtrong, and receiving daily reinforcements, few could be found who were diſpoſed to give any credit to the report. Such as were friendly to the cauſe of the allies, were unwilling to allow the French government ſo much vigour, while it was induſtriouſly circulated by the Jacobins of Germany, that it could not amount to more than 6000 men. The firſt conſul ſet out from Paris on the 5th of May, to take the command of an army, the ſtrength and deſtination of which had given riſe to ſo many conjectures, and on receiving the troops cantoned at Dijon, he proceeded towards Genoa. Having been a ſhort time in the Pays de Vaud, he joined the army of reſerve at the foot of St Bernard, of which he immediately aſſumed the command. It is certain that a very inſignificant force would have been able to arreſt the progreſs of Bonaparte while aſcending the mountain; but either General Melas had heard nothing of its being in motion, or he had implicitly believed the report of the Jacobins. In conſequence of this ignorance or credulity, the army of reſerve encountered no oppoſition till it reached the town of Aoſt, of which the firſt conſul very

ſoon

France. 1800.

ſoon gained poſſeſſion. Having, with the moſt aſtoniſhing perſeveranee, paſſed the fort of Bard, he proceeded on his march down the valley of Aoſt with little oppoſition, till he arrived at the town of Yorea, where the Auſtrians were aſſembled in force, but were obliged to give way before the impetuoſity of the republicans, and poſt themſelves on the heights of Romano behind the Chinſella. It was of vaſt importance as commanding the paſſage of the river, and was occupied by 4000 cavalry, 5000 infantry, and a few pieces of cannon. It was taken on the 26th of May, and the fort of Brunette ſoon after, in conſequence of which the road to Turin was now open. While the republicans were effecting a paſſage over St Bernard, the chief part of the Auſtrians under Melas were employed in the celebration of their victory over them at Nice, little ſuſpecting how ſoon they were to experienee a ſad reverſe of fortune, and that the victors would very ſoon be vanquiſhed. General Melas, at length rouſed from his dream of ſecurity, marched towards Turin with all poſſible ſpeed, in order to defend the Po, and prevent the invaders from arriving at Vienna. He naturally coneluded that Turin would be the firſt important point of attaek made by the French, but in this he was deeeived; for while he prepared to diſpute the paſſage of the Po with the republicans, Bonaparte ſuddenly turned to the left, and entered Milan on the 2d of June.

The army of Bonaparte was very numerous, but he wanted magazines, artillery, and ſtores of every kind; but underſtanding that Pavia was the great depot of the Auſtrian army, he ſent his advaneed guard againſt it under General Lannes, who made an eaſy conqueſt of it, and found in it more than 200 pieces of cannon, 8000 muſkets, 2000 barrels of gunpowder, and a prodigious quantity of all ſorts of proviſions. Another of the chief conſul's generals croſſed the Po at Stradella; and having cut off the communication between General Melas and the country of Piedmont, gained poſſeſſion of the Auſtrian magazines at Piaeenza, Cremona, and a number of other places on the banks of the river.

519 Maſſena in a critical ſituation at Genoa.

About this time it was that Bonaparte became acquainted with the fate of Genoa, by means of intereepted letters. Maſſena did every thing in the power of bravery and perſeverance to keep poſſeſſion of the city; but after he had witneſſed 15,000 of the inhabitants periſh with hunger, he ſurrendered to the Britiſh and Auſtrian commanders on the 5th of June, and obtained very favourable terms, when we conſider that it was impoſſible for him to hold out any longer. The right wing of his army, conſiſting of 8110 men, was permitted to march into France by the way of Niee, and the reſt were to be conveyed by ſea to Antibes, at the expence of Britain; no man was to be deemed reſponſible for having held any publie office under the government of the Ligurian republie; and all officers taken priſoners ſince the commencement of the campaign, were allowed to return to Franee on their parole, not to ſerve till they ſhould be regularly exehanged. By the fall of Genoa, the Auſtrian army which beſieged it was at liberty to co-operate with the commander in chief; and, accordingly, General Ott marched at the head of thirty battalions to check the progreſs of the French army in Piedmont. On the 9th of June he was met by Generals Lannes and Victor at Montebello, where a battle was fought with great fury on both ſides, when the French were victorious, and General Ott retreated with great loſs. Melas being unable to arreſt the progreſs of the republicans by detachments of his army, collected his whole force between Aleſſandria and Tortona, that he might be able to open a way for himſelf to the Auſtrians on the Mincio, if he ſhould find it impoſſible to cruſh the enemy. The conſequence of this ſtep was the ever memorable battle of Marengo, fought on the 14th of June, which has been variouſly deſcribed. The French accounts repreſented the army of General Melas as more numerous than that of the chief conſul, to whoſe ſuperior conduct and bravery alone the French were indebted for ſueceſs. Others have believed that the ſuperiority was on the ſide of the republicans, and think they can diſcover as much from comparing together the different bulletins of the army of reſerve. On this point we pretend not to deeide, only it is certain that the Auſtrians were victorious for nine hours, and the fate of that battle appears to have been decided by the maſterly conduct of General Deſaix, who died on the field. One falſe movement, made by General Melas, which enfeebled his eentre, afforded the gallant Deſaix an opportunity of making a vigorous charge with a body of cavalry that had hitherto been unemployed. General Zach, a man worn out with age and fatigue, when about to take the command of the army from Melas, fell into the hands of the enemy, who remained maſters of the field of battle.

520 Great loſs of the Auſtrians at the battle of Marengo.

The Auſtrians loſt in this engagement above 9000 men, and the French upwards of 12,000, according to their own aecount. Enraged that the victory ſhould be thus ſnatched from them, the Auſtrians were eager to renew the combat on the following day; but General Melas deemed it prudent to check the ardour of his troops, and coneluded a capitulation, ſaid by ſome to be unparalleled in the annals of war. He may have ſigned ſuch a capitulation in conſequence of inſtructions from the eouncil of war at Vienna, or the fortreſſes given up by him may have been deſtitute of proviſions. If we admit the firſt ſuppoſition, it follows that the eouncil of war were determined enemies to the cauſe of the combined powers; and if we go upon the ſecond, Melas himſelf was perhaps the moſt improvident commander that ever was charged with the defence of a country. The whole of Piedmont and Genoa were given up to the French, and an armiſtice was concluded, to laſt till the court of Vienna had time to return its opinion.

General Kray in Italy was anxious to avail himſelf of this armiſtice, to arreſt the progreſs of Moreau's army; but that able general would not liſten to any overtures upon the ſubject, till he ſhould receive inſtructions from Paris. Count St Julien arrived with propoſals of peaee from the Imperial cabinet, in conſequence of which the armiſtice was eoncluded in Germany and Italy, the poſts then occupied by the reſpective armies being conſidered as conſtituting the line of demarcation. In oppoſition to the ſpirit of their ſtipulations with General Melas, the French reinforced their army in Italy, levied immenſe contributions, and raiſed troops in different ſtates declared by themſelves to be independent.

521 Great diſtreſs of the French troops in Egypt.

While France was everywhere victorious in Europe, her troops in Africa were ſubjected to hardſhips and diſgrace. Their being abandoned by their chief made them

France. 1800.

them complain bitterly; and Kleber is said to have declared, that the same *universe* should not contain him and Bonaparte. He continued the negotiations begun by General Bonaparte with the grand vizier for evacuating Egypt, between whom a convention was concluded on the 24th of January 1800, to which Sir Sidney Smith agreed on the part of Great Britain. By virtue of this convention the republican army, its baggage and effects, were to be collected at Alexandria, Rosetta, and Aboukir, to be conveyed to France in vessels belonging to the republic, and such as might be furnished for that purpose by the Sublime Porte. It would seem that nothing could have happened more injurious to the interest of the allies than the evacuation of Egypt upon such terms, since the consul would thus have been furnished with nearly 18,000 troops, which might have been advantageously employed, either in Italy or on the Rhine. It is strange how this important circumstance did not occur to Sir Sidney Smith, and no less so, how he took upon him the office of plenipotentiary. Mr Dundas clearly proved in the house of commons, that he exceeded any power with which he could reasonably conceive himself vested, that being lodged with Lord Elgin at Constantinople.

522 General Kleber assassinated.

In the latter end of the year 1799, the British ministry had reason to believe that a negotiation would take place between the grand vizier and General Kleber, respecting the evacuation of Egypt by the troops of the latter; and as such an event was much to be desired, Lord Keith received orders to accede to it, on condition that General Kleber and his army should be detained as prisoners of war, instead of being sent back to France. This was bitterly complained of in France, and numbers even in England exclaimed against it as a flagrant breach of faith, while General Kleber himself did not consider it in such a light, although the only person who had reason to do so, could he have done it with fairness. On the 20th of March he attacked the Turks in the vicinity of Cairo, who fled before him in all directions, and left more than 8000 men dead and wounded on the field of battle. By this conquest Cairo was restored to the French, which in terms of the convention they had abandoned. Kleber again proposed to evacuate Egypt, on the terms agreed to by the grand vizier and Sir Sidney Smith, and Lord Keith being ordered to agree to them by the cabinet of St James's, a suspension of hostilities took place, and the Turks were ready to be delivered from enemies whom they were not able to expel, when General Kleber was suddenly assassinated.

523 Of which Menou is unjustly suspected.

Both parties had reason to regret this event, as General Kleber appears to have been, not only the most honourable, but by far the ablest commander of the republicans, in that quarter of the globe. It is not certainly known by whom he was murdered, nor who were the contrivers of such a plot; but at Constantinople his successor Menou was strongly suspected. We must confess that he was not friendly to Kleber; but on the other hand we do not find General Reynier, in his "State of Egypt," insinuate any thing of this nature against Menou, although he treats his conduct and abilities with some degree of contempt; and we are informed that the assassin himself, previous to his execution, solemnly acquitted Menou from being in the least acquainted with the plot.

France. 1801.

As Menou refused to leave Egypt by capitulation, the British government formed the resolution of driving him out of it by force. Sir James Pulteney received the command of 12,000 men, to act in the Mediterranean in such a manner as might most effectually annoy the enemy; a plan which was disconcerted by the issue of the battle of Marengo. He was superseded by Sir Ralph Abercromby, who carried reinforcements along with him, together with a train of artillery from Gibraltar. He touched at Minorca and Malta, from whence he steered his course for the coast of Egypt, which he reached on the 1st of March 1801, and anchored next day in the bay of Aboukir; but the weather prevented him from attempting to land till the 7th of that month, at 10 o'clock in the forenoon. The first division effected a landing in the face of the French, to the amount of 4000 men, whose position was so very advantageous, that an eye witness thought they might have resisted the world; yet 2000 British troops drove them from it, with the loss of some field pieces, and the disembarkation was continued during that and the following day.

524 General Abercromby sails for Egypt.

525 The French conquered by the British near Alexandria, and General Abercromby mortally wounded.

The whole army of General Abercromby moved forward on the 12th, and coming in sight of the main body of the French, gave them battle on the 13th. The conflict was obstinate on both sides, and their loss very considerable, but victory in the end declared for the British. This advantage was followed up with vigour, and on the 21st a more interesting battle was fought with similar success, about four miles from the city of Alexandria. Sometimes the French had the advantage, and sometimes the British, but the latter were finally victorious. General Abercromby, that he might not damp the ardour of his troops, concealed for two hours the anguish of a mortal wound he received in this action:—a degree of magnanimity which has very seldom been equalled, and we believe never was surpassed. The loss of the British on this occasion was estimated at 1500, and that of the French at 4000 men.

526 The Northern confederacy.

As it may be said that the fate of Egypt was decided in a great measure by these two battles, we beg leave to call the attention of our readers to affairs of great importance which about this time took place in Europe. The powers of the north, envious of the superiority of Britain by sea, and acting under the influence of the capricious Paul, were resolved to revive the armed neutrality of Catharine II. during the continuance of the American war, and claimed a right of trading to the ports of France, without being subjected to have their vessels searched. The ministry of Great Britain were determined to break such a confederacy; but to the astonishment of the nation they resigned at this period. Different causes have been assigned for an event which was so unexpected; but the ostensible reason was a difference in the cabinet relative to catholic emancipation. After the union of Ireland with Britain, it seems pretty clear that the minister did propose this subject in the cabinet, but his majesty, from a sacred regard to his coronation oath, put his negative upon it, in consequence of which Mr Pitt and his friends gave in their resignation. In general they were succeeded by men who had countenanced their administration during the war. Mr Addington was appointed first lord of the treasury, and chancellor of the exchequer;

527 A change of ministry takes place in Britain.

France. 1801.

chequer; Lord Eldon, lord high chancellor; the earl of St Vincent, firſt lord of the admiralty; Lords Hawkesbury and Pelham, ſecretaries of ſtate, and the honourable Colonel Yorke, ſecretary at war. The former miniſtry was diſſolved on the 11th of February; but owing to the indiſpoſition of his majeſty, none of the new miniſtry entered upon office before the middle of March, during which eventful interval Mr Pitt and his aſſociates had the chief management of public affairs. The new miniſtry entered upon office by ſolemnly pledging themſelves to the nation, that they would employ their united efforts in procuring a ſafe and honourable peace with France, while they never loſt ſight for a moment of the warlike plans of thoſe who had preceded them.

About this time the moſt hoſtile meaſures were adopted by the powers compoſing the northern confederacy. The free city of Hamburgh was taken by a Daniſh army under Charles prince of Heſſe, in order to injure the commerce of Great Britain; and the king of Pruſſia ſent a numerous army into the electorate of Hanover. To puniſh this unaccountable conduct, and diſſolve the northern confederacy, a fleet of 17 ſail of the line, four frigates, four ſloops, and ſome bomb veſſels was fitted out in the ports of Britain, which ſailed from Yarmouth on the 12th of March, under the command of Admiral Sir Hyde Parker, Lord Nelſon, and Rear-admiral Graves, and having paſſed the Sound, appeared before Copenhagen on the 30th of the ſame month. The Danes did not appear in the ſmalleſt degree agitated, for it was impoſſible to moleſt either the fleet or the city, without paſſing through a channel ſo extremely intricate, that it was once believed hardly ſafe to attempt it with a ſingle ſhip, and without any enemy to oppoſe. This channel was ſounded by Lord Nelſon, who undertook to conduct a large diviſion of the fleet through it, requeſting from Sir Hyde Parker the command of it, which was accordingly given him, and Rear-admiral Graves was his ſecond in command.

528 The Danes vanquiſhed by Lord Nelſon at Copenhagen.

As the largeſt ſhips drew too much water for being employed in ſuch a hazardous attempt, his lordſhip ſelected 12 of from 74 to 50 guns, together with four frigates, four ſloops, two fire-ſhips, and ſeven bombs. A moſt prodigious force was oppoſed to this, conſiſting of ſix ſail of the line, 11 floating batteries, each mounting from 26 twenty-four pounders to 18 eighteen pounders, one bomb-ſhip, and a number of ſchooners. Theſe were ſupported by the Crown iſlands, mounting 88 pieces of cannon; by four ſail of the line, moored in the mouth of the harbour, and by a few batteries on the iſland of Amak. Lord Nelſon attacked this tremendous force on the 2d of April, and ſilenced the firing of the batteries after an obſtinate and bloody action which laſted four hours, taking, burning, and ſinking about 17 ſail, including ſeven ſail of the line. In killed and wounded the Britiſh loſt 943 men, while that of the Danes muſt have been at leaſt double the number. A ſuſpenſion of hoſtilities was the immediate conſequence of this brilliant victory, and a treaty of armed neutrality to laſt for 14 weeks.

529 Who ſails from thence to Carlſcrona.

After repairing the ſhips that were damaged upon this occaſion, the Britiſh fleet ſailed for Carlſcrona, and appeared before it on the 19th of April. The governor here was immediately informed by the Britiſh admiral of what had happened at Copenhagen, requeſting his Swediſh majeſty to give an explicit anſwer whether he meant to adhere to, or abandon the confederacy. The reply was very ambiguous; but having received the news of the ſudden death of the emperor Paul, on the 23d of March, and Lord Nelſon, now commander in chief, writing in a more peremptory tone than the officer whom he had ſuperſeded, the court of Stockholm deemed it prudent to follow the example of that of Copenhagen. Alexander, the ſon and ſucceſſor of Paul, poſſeſſed of more honour and juſtice than his father, reſtored all the Britiſh property which he had confiſcated, relinquiſhed his abſurd claim to the iſland of Malta, and agreed that neutral veſſels ſhould be ſearched, when bound for any one country at war with another, which proved the grave of the northern confederacy.

France. 1801.

When the armiſtice was ſigned between the Auſtrian and French generals in the year 1800, the troops of the latter were in poſſeſſion of Germany almoſt to the banks of the Inn, and of Italy to the frontiers of Venice; but the ſpirit of the emperor was yet unſubdued, and he would not abandon his allies by a confirmation of the preliminaries of peace which Count St Julian had agreed to at Paris, as he exceeded the powers with which he was entruſted. Kray having retired from ſervice, the archduke John ſucceeded him, with whom the emperor in perſon repaired to the army; but they ſoon found it impracticable to act an offenſive part againſt General Moreau, and therefore another armiſtice comprehending Italy, was agreed to. The emperor wiſhed to include Britain in any treaty with France, but as Bonaparte would admit no plenipotentiary from that country without the benefit of a naval armiſtice, which it was truly abſurd to expect, General Moreau received orders to go on with his military operations.

530 The Auſtrians totally routed at Hohenlinden.

The army of Auſtria was now given to the command of generals whoſe very names were almoſt unknown beyond the confines of their own country, and who evinced themſelves but very little acquainted with the military art. As Moreau was pondering on the plan of his winter campaign, the right wing of his army was attacked by the Auſtrians with ſuch vigour, as had nearly reduced him to the neceſſity of acting on the defenſive; and had General Klenau known how to make a temperate uſe of his victory on this occaſion, the ruin of the French commander would have been inevitable. The caſe was otherwiſe. Elated with his ſucceſs, he unaccountably abandoned his poſition on the Inn, and engaging his cautious and able antagoniſt at the village of Hohenlinden, was totally routed, with the loſs of 80 pieces of cannon, 200 caiſſons, and 10,000 priſoners, independent of a prodigious number left dead on the field.

General Moreau allowing the enemy no time to rally, proceeded directly towards the Inn, croſſing it on the 9th of December, 1800, and driving his enemies before him, ſtruck the court of Vienna with conſternation and diſmay. Prince Charles was recalled to the command of the army, but after many fruitleſs efforts to retrieve its loſt honour, he propoſed an armiſtice on the 27th of December, which was granted by the French commander, on condition that it ſhould be immediately followed by a definitive treaty. If the archduke could have had any dependence on his army, although

France. 1801. although very much weakened, this armiſtice, in all probability, would not have taken place, for the poſition of Moreau was perilous in the extreme. In the very heart of Auſtria, he had behind him on his right, about 30,000 men in the Tyrol, with upwards of 50,000 on his left. But Auſtrian valour was now almoſt extinguiſhed by ſo many ſad reverſes of fortune, and Auſtrian officers were not true to their truſt.

531 Treaty of Luneville. This armiſtice was followed by a treaty of peace ſigned at Luneville on the 9th of February 1801, between the emperor for himſelf and the Germanic body, and the firſt conſul of the French republic, in the name of the people of France. By it the emperor ceded the Briſgau to the duke of Modena, for the territories loſt by that prince in Italy, and bound himſelf to find indemnities in the Germanic empire for all thoſe princes whom the fate of war had deprived of their dominions. The grand duke of Tuſcany was to renounce his dukedom for ever, with its dependencies in the iſle of Elba, to the infant duke of Parma, for which the empire was to furniſh him with an adequate indemnification.

On the 28th of March a treaty of peace was concluded between the French republic and the king of the Two Sicilies, by which his majeſty obliged himſelf to ſhut all the ports of Naples and Sicily againſt ſhips of every deſcription belonging either to the Britiſh or the Turks, till theſe powers ſhould conclude a treaty with the French republic, and till Britain and the northern powers ſhould come to a good underſtanding. He renounced for ever Porto Longano in the iſle of Elba, his ſtates in Tuſcany, and the principality of Piombino, to be diſpoſed of in ſuch a manner as the French republic might think proper.

532 Britain deſerted by almoſt all Europe. Great Britain had now none to aſſiſt her in the conteſt with France, but the Turks in Egypt and the Portugueſe in Europe, powers which rather diminiſhed than increaſed her ſtrength, by dividing it. The Spaniards had made an attack upon Portugal at the deſire of France, conquering ſome of its provinces; but a treaty of peace was concluded between them on the 6th of June, by which the king of Spain reſtored all his conqueſts except the fortreſs of Olivenza, and the prince regent of Portugal and Algarva promiſed to ſhut the ports of his whole territories againſt the ſhips of Great Britain, and to make indemnification to his Catholic majeſty for all loſſes and damages ſuſtained by his ſubjects during the war.

533 Bonaparte threatens to invade Britain. When the chief conſul had made peace with all his other enemies, he threatened Great Britain with an immediate invaſion, which gave great uneaſineſs at firſt to a conſiderable part of the nation, but it gradually ſubſided. In order to diminiſh this alarm, Lord Nelſon was ſent to deſtroy the ſhipping and harbour of Boulogne. His ſucceſs in this undertaking fell ſhort of the expectations which many had formed; but he made ſuch an impreſſion on the enemy on the 4th of Auguſt, as evinced that Britain could annoy the coaſt of France with greater facility, than France could moleſt that of Britain. It was alſo highly ſatisfactory to find that the ſpirit of the Britiſh navy was not excluſively attached to the hero of the Nile; for Rear-admiral Saumarez having, in the month of July, come up with a combined ſquadron of French and Spaniſh ſhips of war bound for Cadiz, much ſuperior to his own, he ſcrupled not to give them battle, the conſequence of which was, that one of them was captured, and two more were burnt.

France. 1802. Attempts were again made by Britain during the ſummer of 1801, to negotiate with France. The firſt conſul could not but ſee, from the total diſſolution of the northern confederacy, that it was impoſſible for him to ruin the Britiſh commerce, and conſequently that all the treaties he had made for the purpoſe of excluding our ſhips from neutral ports would ſignify nothing. He ſeemed determined, however, to keep poſſeſſion of Egypt; and Britain, on the other hand, was as fully reſolved to wreſt it from him. On this account the negotiations were protracted, till the conqueſt of that country was known at London and Paris.

534 Britain attempts to treat with France.

535 Roſetta, Cairo, and Alexandria, taken by the Britiſh. When Sir Ralph Abercromby died, General Hutchinſon ſucceeded to the command of the Britiſh forces in Egypt, who was probably acquainted with the plan of his much lamented predeceſſor, as one ſpirit ſeemed to actuate both. Roſetta ſoon ſurrendered, which was followed by the conqueſt of Cairo; and Menou having accepted of ſimilar terms for Alexandria, the whole of Egypt fell into the hands of the allies, and the republican troops and baggage were conveyed to the neareſt French ports in the Mediterranean, in ſhips furniſhed them by the allies. After theſe events, the negotiations between Britain and France went on more agreeably; and, on the 1ſt of October, the preliminaries of peace were ſigned at London by Lord Hawkeſbury on the part of his Britannic majeſty, and M. Otto on that of the French republic. By it Great Britain engaged to give up all the conqueſts made during the continuance of the war, excepting the iſlands of Ceylon and Trinidad. France was to reſtore nothing. The Cape of Good Hope was to be free to all the contracting parties; the iſland of Malta was to be given to the knights of the order of St John of Jeruſalem; Egypt was to be given to the Ottoman Porte; Portugal was to be maintained in its integrity, except what was ceded to the king of Spain by the prince regent; Naples and the Roman ſtates were to be evacuated by the French, Porto Ferrajo by the Britiſh, with all the ports and iſlands occupied by them in the Mediterranean; and plenipotentiaries were appointed to meet at Amiens, for the purpoſe of drawing up and ſigning the definitive treaty. This was concluded on the 22d of March 1802, in conſequence of which the French republic was acknowledged by the whole of Europe.

536 Peace concluded at Amiens between Britain and France. The reſtoration of peace, after ſo long and ſanguinary a conteſt, gave the higheſt ſatisfaction to all ranks and denominations of men, with the exception, perhaps, of a few intereſted individuals; and it was certainly as honourable to Britain as could well be expected from the nature of the war. It was celebrated at Paris, in the cathedral of Notre Dame, with great pomp and magnificence. The celebration of the re-eſtabliſhment of the Catholic religion in France, to which the majority of the people were warmly attached, gave additional importance to the ſcene in that country, and the meaſure evinced the moſt conſummate political wiſdom on the part of Bonaparte, whoſe popularity in conſequence of it was very much increaſed. We muſt now lay before our readers the celebrated *Concordat*, or convention concluded between Bonaparte and the pope, by which the Catholic faith was again eſtabliſhed in that country.

France. 1802.

Copy of the late important Convention between the French Government and His Holineſs the Pope, Pius VII. *ratified the* 23d Fructidor, *year* 9, (10th September, 1801).

The chief conſul of the French republic, and his holineſs the ſovereign pontiff, Pius VII. have named as their reſpective plenipotentiaries—

The chief conſul, the citizens Joſeph Bonaparte, counſellor of ſtate; Cretet, counſellor of ſtate; and Bernier, doctor of divinity, curate of St Laud d'Angers; furniſhed with full powers:

His holineſs, his eminence Monſeigneur Hercule Conſa'vi, cardinal of the holy Roman church, deacon of St Agathe *ad Suburrum*, his ſecretary of ſtate; Joſeph Spina, archbiſhop of Corinth, domeſtic prelate to his holineſs, attendant on the pontifical throne; and Father Caſelli, his holineſs's adviſer on points of theology; in like manner furniſhed with full powers in due form:

Who, after exchanging their full powers, have concluded the following convention:

Convention between the French Government and his Holineſs the Pope, Pius VII.

The government of the republic acknowledges that the Catholic, Apoſtolical, and Roman religion, is the religion of the great majority of French citizens.

His holineſs, in like manner, acknowledges that this ſame religion has derived, and is likely to derive, the greateſt benefit and the greateſt ſplendour from the eſtabliſhment of the Catholic worſhip in France, and from its being openly profeſſed by the conſuls of the republic.

This mutual acknowledgment being made, in conſequence, as well for the good of religion as for the maintenance of interior tranquillity, they have agreed as follows:

Article 1. The Catholic, Apoſtolical, and Roman religion ſhall be freely exerciſed in France. Its ſervice ſhall be publicly performed, conformably to the regulations of police, which the government ſhall judge neceſſary for the public tranquillity.

2. There ſhall be made by the holy ſee, in concert with the government, a new diviſion of French dioceſes.

3. His holineſs ſhall declare to the titular French biſhops that he expects from them, with the firmeſt confidence, every ſacrifice for the ſake of peace and unity —even that of their ſees.

After this exhortation, if they ſhould refuſe the ſacrifice commanded for the good of the church (a refuſal, nevertheleſs which his holineſs by no means expects), the ſees of the new diviſion ſhall be governed by biſhops appointed as follows:

4. The chief conſul ſhall preſent, within three months after the publication of his holineſs's bull, to the archbiſhoprics and biſhoprics of the new diviſion. His holineſs ſhall confer canonical inſtitution, according to the forms eſtabliſhed in France before the revolution (*avant le changement de gouvernement*).

5. The nomination to the biſhoprics which become vacant in future, ſhall likewiſe belong to the chief conſul, and canonical inſtitution ſhall be adminiſtered by the holy ſee, conformably to the preceding article. France. 1802.

6. The biſhops, before entering upon their functions, ſhall take, before the chief conſul, the oath of fidelity which was in uſe before the revolution, expreſſed in the following words:

"I ſwear and promiſe to God, upon the Holy Evangeliſts, to preſerve obedience and fidelity to the government eſtabliſhed by the conſtitution of the French republic. I likewiſe promiſe to carry on no correſpondence, to be preſent at no converſation, to form no connexion, whether within the territories of the republic or without, which may, in any degree, diſturb the public tranquillity: and if, in my dioceſe or elſewhere, I diſcover that any thing is going forward to the prejudice of the ſtate, I will immediately communicate to governmen all the information I poſſeſs."

7. Eccleſiaſtics of the ſecond order ſhall take the ſame oath before the civil authorities appointed by the government.

8. The following formula of prayer ſhall be recited at the end of divine ſervice in all the Catholic churches of France.

Domine, ſalvam fac rempublicam.
Domine, ſalvos fac conſules.

9. The biſhops ſhall make a new diviſion of the pariſhes in their dioceſes, which, however, ſhall not take effect till after it is ratified by government.

10. The biſhops ſhall have the appointment of the pariſh prieſts.

Their choice ſhall not fall but on perſons approved of by government.

11. The biſhops may have a chapter in their cathedral, and a ſeminary for the dioceſe, without the government being obliged to endow them.

12. All the metropolitan, cathedral, parochial, and other churches which have not been alienated, neceſſary to public worſhip, ſhall be placed at the diſpoſal of the biſhops.

13. His holineſs, for the ſake of peace and the happy re-eſtabliſhment of the Catholic religion, declares that neither he nor his ſucceſſors will diſturb in any manner thoſe who have acquired the alienated property of the church; and that in conſequence that property, and every part of it, ſhall belong for ever to them, their heirs and aſſigns.

14. The government ſhall grant a ſuitable ſalary to biſhops and pariſh prieſts, whoſe dioceſes and pariſhes are compriſed in the new diviſion.

15. The government ſhall likewiſe take meaſures to enable French Catholics, who are inclined, to diſpoſe of their property for the ſupport of religion.

16. His holineſs recogniſes in the chief conſul of the French republic the ſame rights and prerogatives in religious matters which the ancient government enjoyed.

17. It is agreed between the contracting parties, that in caſe any of the ſucceſſors of the preſent chief conſul ſhould not be a Roman Catholic, the rights and prerogatives mentioned in the foregoing article, as well as the nomination to the biſhop's ſees, ſhall be regulated, with regard to him, by a new convention.

The ratifications ſhall be exchanged at Paris in the ſpace of forty days.

Done

France. 1802.

Done at Paris, the 26th Meſſidor, year 9 of the French republic.

(Signed) JOSEPH BONAPARTE.
HERCULES, CARDINALIS CONSALVI.
JOSEPH, Archiep. Corinthi.
BERNIER.
F. CAROLUS CASELLI.

REGULATIONS *of the Gallican Church.*

TITLE I.—*Of the Regulation of the Catholic Church, as connected with the Policy of the State.*

Article 1. No bull, reſcript, decree, proviſion, or any thing in the place of a proviſion, or, in ſhort, any other diſpatch from the court of Rome, even though it ſhould relate to individuals only, ſhall be received, publiſhed, printed, or otherways put in force, without the authority of the government.

2. No individual, aſſuming the character of nuncio, legate, vicar, or apoſtolic commiſſary, or whatever other appellation he may aſſume, ſhall be allowed to exerciſe his functions in France, but with the conſent of the government, and in a manner conformable to the liberties of the Gallican church.

3. The decrees of foreign ſynods, or even of general councils, ſhall not be publiſhed in France before the government ſhall have examined their form, their conformity to the laws, rights, and privileges of the French republic, and whatever might in their publication have a tendency to alter or to affect public tranquillity.

4. No national or metropolitan council, no diocefan ſynod, no deliberative aſſembly, ſhall be allowed to be held without the expreſs permiſſion of government.

5. All eccleſiaſtical functions ſhall be gratuitous, with the exception of thoſe oblations which ſhall be authoriſed, and fixed by particular regulation.

6. Recourſe ſhall be had to the council of ſtate in every inſtance of abuſe, on the part of ſuperiors, and other eccleſiaſtical perſons. The inſtances of abuſe are uſurpation, or exceſs of power; contravention of the laws and inſtitutions of the republic; infraction of the rules conſecrated by the canons received in France; any attack upon the liberties, franchiſes, and cuſtoms of the Gallican church; and any attempt, which, in the exerciſe of worſhip, can compromiſe the honour of citizens, arbitrarily trouble their conſcience, or lead to oppreſſion, injury, or public ſcandal.

7. There ſhall alſo be a right of appeal to the council of ſtate, on the ground of any attempt being made to interrupt the exerciſe of public worſhip, and to infringe on that liberty which the general laws of the republic, as well as particular regulations, guarantee to its miniſters.

8. An appeal ſhall be competent to any perſon intereſted; and in caſe no complaint is exhibited by individuals, the buſineſs ſhall be taken up officially by the prefects. The public functionary, eccleſiaſtical or individual, who ſhall wish to exerciſe this right of appeal, muſt addreſs a ſigned memoir, containing a detail of the grievance complained of, to the counſellor of ſtate, preſiding over religious affairs, whoſe duty it will then become to make, with the leaſt poſſible delay, every inquiry into the ſubject; and upon his report the affair ſhall be definitively ſettled, or ſent back, according to the urgency of the caſe, to the competent authorities.

TITLE II.—*Of the Clergy.*

Sect. I. *General Regulations.*

Article 9. The Catholic worſhip ſhall be exerciſed under the direction of the archbiſhops and biſhops in their dioceſes, and under that of the *curés*, in their pariſhes.

10. Every privilege derogating from eccleſiaſtical juriſdiction is aboliſhed.

11. The archbiſhops and biſhops may, with the permiſſion of the government, eſtabliſh in their dioceſes cathedral chapters and ſeminaries. All other eccleſiaſtical eſtabliſhments are ſuppreſſed.

12. Archbiſhops and biſhops may adopt the title of citizen, or monſieur, as they ſhall judge moſt fit; all other qualifications are forbidden.

Sect. II. *Of the Archbiſhops, or Metropolitans.*

Article 13. The archbiſhops ſhall conſecrate and inſtal their ſuffragans. In caſe of failure, or refuſal on their part, their place ſhall be ſupplied by the eldeſt biſhop of the metropolitan diſtrict.

14. They ſhall watch over the maintenance of doctrine and diſcipline in the dioceſes dependent on their ſee.

15. They ſhall hear and judge of complaints and appeals againſt the conduct and deciſions of the ſuffragan biſhops.

Sect. III. *Of the Biſhops, the Vicars-General, and the Seminaries.*

Article 16. No perſon can be named a biſhop who is not a Frenchman, and who is not at leaſt thirty years of age.

17. Before the decree for the nomination is diſpatched, he ſhall be bound to produce an atteſtation of the correctneſs of his conduct and manners, furniſhed by the biſhop of that dioceſe in which he ſhall have exerciſed the functions of the miniſtry; he ſhall undergo an examination reſpecting his tenets, by a biſhop and two prieſts commiſſioned by the chief conſul, and who ſhall addreſs the reſult of their examination to the counſellor of ſtate who preſides over the department of eccleſiaſtical affairs.

18. The prieſt, nominated by the chief conſul, ſhall endeavour without delay to procure inſtallation from the pope; he ſhall be permitted to perform no function till the bull authoriſing his inſtallation ſhall have received the ſanction of government, and till he ſhall have taken in perſon the oath preſcribed by the convention entered into between the French government and the holy ſee. This oath ſhall be taken to the chief conſul, and a minute of it ſhall be entered by the ſecretary of ſtate.

19. The biſhops ſhall nominate and inſtal the *curés*; they ſhall not however make public their appointment, nor ſhall they give them canonical inſtruction, till their nomination ſhall have been agreed to by the chief conſul.

20. They ſhall be bound to reſide in their dioceſes, and ſhall not be ſuffered to quit them without the permiſſion of the chief conſul.

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21. Each biſhop ſhall be empowered to appoint two, and each archbiſhop three, vicars-general: they ſhall make choice of them from among thoſe prieſts who poſſeſs the requiſite qualifications for being biſhops.

22. They ſhall viſit annually in perſon a certain portion of their dioceſe; and within the ſpace of five years the whole of it. In caſe unavoidable circumſtances ſhall prevent them from making this viſit, it ſhall be made by a vicar-general.

23. The biſhops ſhall be bound to organize their ſeminaries, and the rules of this organization ſhall be ſubmitted to the approbation of the chief conſul.

24. Thoſe who ſhall be choſen teachers in theſe ſeminaries ſhall ſubſcribe the declaration made by the French clergy in 1682, and publiſhed by an edict of the ſame year. They ſhall limit themſelves to teach only the doctrine therein contained; and the biſhops ſhall addreſs a certificate of their abiding by this limitation, to the counſellor of ſtate who preſides over the eccleſiaſtical department.

25. The biſhops ſhall ſend every year to this counſellor of ſtate the names of the ſtudents of thoſe ſeminaries who are deſtined to the holy miniſtry.

26. They ſhall appoint no eccleſiaſtic who does not poſſeſs a property of the annual value of 300 francs, unleſs he has attained the age of 25 years, and poſſeſs the qualities required by the canons of France.

The biſhops ſhall perform no ordination before the number of perſons to be ordained has been ſubmitted to the government, and by them agreed to.

Sect. IV. *Of the Curés.*

Article 27. The curés ſhall perform no eccleſiaſtical functions before they have taken, in the preſence of the prefect, the oath preſcribed by the convention entered into between the government and the holy ſee. A copy of this oath ſhall be made out by the ſecretary of the prefect-general, and regularly lodged with each party.

28. They ſhall be introduced to the poſſeſſion of their benefice either by a curé, or by a prieſt whom the biſhop ſhall point out.

29. They ſhall be bound to reſide in their reſpective pariſhes.

30. The curés ſhall be directly ſubject to the biſhops in the exerciſe of their functions.

31. The vicars, and the aſſiſtants performing their duties, ſhall be under the ſuperintendence and direction of the curés.

They ſhall be approved by the biſhop, and liable to be recalled by his authority.

32. No foreigner ſhall be employed in the functions of the eccleſiaſtical miniſtry, without the permiſſion of the government.

33. Every eccleſiaſtic, though a Frenchman, is forbidden the exerciſe of eccleſiaſtical functions, unleſs connected with ſome dioceſe.

34. No prieſt ſhall quit his dioceſe to ſerve in another without the permiſſion of his biſhop.

Sect. V. *Of the Cathedral Chapters, and the Government of the Dioceſes, during the Vacancy of the See.*

Article 35. The archbiſhops and biſhops who ſhall wiſh to exerciſe the power which is given them, by eſtabliſhing chapters, ſhall make no appointment without having previouſly obtained the authority of the government, not only for the eſtabliſhment itſelf, but for the number and choice of the eccleſiaſtics by whom they are to be formed.

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36. During the vacancy of the ſee, the metropolitan, or, in his ſtead, the oldeſt of the ſuffragan biſhops, ſhall watch over the governments of the dioceſes.

The vicars-general of theſe dioceſes ſhall continue their functions after the death of the biſhop, till the inſtallation of his ſucceſſor.

37. It ſhall be the duty of the metropolitans and the cathedral chapters to communicate to the government information of the vacancy of ſees, and the ſteps which may have been taken for the government of vacant dioceſes.

38. The vicar-general, who ſhall govern during the vacancy, as well as the metropolitan and conſtituent members of chapters, ſhall ſuffer no innovation to be introduced into the uſages and cuſtoms of the dioceſes.

Title III.—*Of Worſhip.*

Article 39. There ſhall be only one liturgy, and one catechiſm, for all the Catholic churches of France.

40. No curé ſhall appoint extraordinary public prayers in his pariſh, without the ſpecial permiſſion of the biſhop.

41. No feſtival, with the exception of the ſabbath, ſhall be eſtabliſhed without the permiſſion of government.

42. The eccleſiaſtics ſhall uſe, in the performance of religious ceremonies, the habits and ornaments ſuitable to their titles.

They ſhall in no caſe, or under any pretence, aſſume the colour and the diſtinctive marks reſerved to the biſhops.

43. All eccleſiaſtics ſhall dreſs according to the French faſhion, and in black. The biſhops ſhall add to this coſtume the paſtoral croſs, and violet ſtockings.

44. Domeſtic chapels and oratories, for the accommodation of individuals, ſhall not be eſtabliſhed without the expreſs permiſſion of the government, granted on the application of the biſhop.

45. No religious ceremony ſhall be ſolemnized without the temples conſecrated to the Catholic worſhip, in places deſtined to different forms of worſhip.

46. The ſame temple ſhall be excluſively conſecrated to the ſame ſyſtem of worſhip.

47. There ſhall be in the different cathedrals and parochial churches, a place ſpecially appointed for the civil and military authorities.

48. The biſhop ſhall concert with the prefect the means of calling the faithful to religious worſhip by public bells, which are to be rung on no other occaſion, without the permiſſion of the local police.

49. When the government ſhall appoint public prayers, the biſhops ſhall concert with the prefect, and the military commandant of the place, the day, the hour, and the manner in which theſe regulations are to be carried into effect.

50. The ſolemn inſtructions known under the appellation of *ſermons*, and thoſe diſtinguiſhed under the name *de ſtations*, at the time of Advent and Lent, ſhall not be delivered but by prieſts who have obtained the ſpecial authority of the biſhop.

51. The curés in the ordinary exerciſe of their parochial duties ſhall pray for, and ſhall cauſe prayers to be

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be offered up in behalf of the proſperity of the French republic, and the ſafety of the French conſuls.

52. They ſhall introduce into their inſtructions no cenſure direct or indirect, either of individuals or of other forms of worſhip authoriſed by the ſtate.

53. In their pulpits they ſhall introduce no publication foreign to the exerciſe of public worſhip, till it has at leaſt received the authority of the government.

54. The nuptial benediction ſhall be given to thoſe only who ſhall prove in due form, that their marriage has been contracted before a civil magiſtrate.

55. The regiſters kept by the miniſters of religion, not being founded upon any thing but the adminiſtration of the ſacraments, are in no caſe to ſupply the regiſters appointed by the law to aſcertain the civil condition of the French people.

56. In all eccleſiaſtical and religious acts, the equinoctial calendar eſtabliſhed by the laws of the republic is to be continued, and particular days ſhall retain the names which they poſſeſs in the ſolſtitial calendar.

57. The day of repoſe for the public functionaries ſhall be Sunday.

TITLE IV.—*Of the Arrangement of Archbiſhops, Biſhops, Pariſhes, Edifices appropriated to public worſhip, and the ſalaries of the Clergy.*

Sect. I. *Of the Arrangement of Archbiſhops and Biſhops.*

Article 58. There ſhall be in France 10 archbiſhops and 50 biſhops.

59. The arrangement of the archbiſhoprics and dioceſes ſhall be made in conformity to the ſubjoined plan.

Sect. II. *Of the Arrangement of Pariſhes.*

Article 60. There ſhall be at leaſt one pariſh within the juriſdiction of a juſtice of peace. There ſhall be beſides eſtabliſhed as many ſubſidiary places of worſhip as circumſtances may require.

61. Each biſhop, in concert with the prefect, ſhall regulate the number and extent of theſe ſubſidiary eſtabliſhments: the plan formed ſhall be ſubmitted to the inſpection of the government, and ſhall not be put into execution without its authority.

62. No portion of the French territory ſhall be formed into a diſtrict, ſubject to the adminiſtration of a curé, or to any ſubſidiary eſtabliſhment, without the expreſs authority of government.

63. The prieſts ſerving in theſe ſubſidiary eſtabliſhments are to be named by the biſhops.

Sect. III. *Of the Salaries of the Clergy.*

Article 64. The ſalary of the archbiſhops is to be 15,000 francs (about 625l. ſterling).

65. The biſhops are to receive 10,000 francs (about 420l. ſterling).

66. The curés are divided into two claſſes. The ſalary of the curés of the firſt claſs is to be 1500 francs (about 62l. ſterling); that of the ſecond claſs is to be 1000 francs (about 42l. ſterling).

67. The penſions they enjoy according to the regulations of the conſtituent aſſembly ſhall be deducted from their ſalaries.

The general councils of the larger communes ſhall be empowered to grant them an augmentation of ſalary, ſuch as circumſtances may require.

68. The vicars, and thoſe performing their functions, ſhall be choſen from among the eccleſiaſtics receiving penſions, in conformity to the laws of the conſtituent aſſembly. France. 1802.

The amount of theſe penſions, and the produce of oblations ſhall conſtitute their ſalary.

69. The biſhops ſhall form a plan of regulations relative to the offerings which the miniſters of religion ſhall be authoriſed to receive for the adminiſtration of the ſacraments. The plan of the regulations furniſhed by the biſhops ſhall not be publiſhed or otherwiſe put into execution till they have received the approbation of the government.

70. Every eccleſiaſtic now receiving a penſion from the ſtate ſhall be deprived of it on refuſing, without ſufficient reaſon, to take upon him the functions which he is required to diſcharge.

71. The general councils of the departments are authoriſed to procure for the biſhops and archbiſhops ſuitable places of reſidence.

72. The parſonages and gardens pertaining to them which have not been alienated, ſhall be reſtored to the curés, and thoſe officiating in the ſubſidiary places of worſhip. In caſes where theſe parſonages cannot be procured, the general councils of the *commune* are authoriſed to procure for them a ſuitable lodging and garden.

73. The foundations which have for their object the maintenance of religion and the exerciſe of public worſhip, are to conſiſt only of funds appointed by the ſtate; they are to be accepted by the dioceſe and biſhop, and are not to be enforced without the authority of the government.

74. The fixed property, except the buildings deſtined to the accommodation of the miniſter, is not to be affected by eccleſiaſtical titles, or poſſeſſed by the miniſters of religion in conſequence of their functions.

Sect. IV. *Of the Edifices appropriated to public worſhip.*

Article 75. The buildings formerly appropriated to the Catholic worſhip, which are now at the diſpoſal of the nation, ſhall be given up to the diſpoſition of the biſhops by decrees of the prefect of the department: a copy of theſe decrees ſhall be addreſſed to the counſellor of ſtate who is intruſted with the regulation of religious affairs.

76. Offices ſhall be eſtabliſhed for the purpoſe of ſuperintending the ſupport and preſervation of temples, and the adminiſtration of charitable contributions.

77. In thoſe pariſhes where there exiſts no buildings fit for being employed as a place of religious worſhip, the biſhop ſhall conſult with the prefect reſpecting the eſtabliſhment of a ſuitable edifice.

Table of the Arrangement of the new Archbiſhoprics and Biſhoprics of France.

Paris.—This archbiſhopric ſhall comprehend the department of the Seine.
Troyes—l'Aube and l'Yonne.
Amiens—la Somme and l'Oiſe.
Soiſons—l'Aiſne.
Arras—le Pas de Calais.
Cambray—le Nord.
Verſailles—Seine-et-Oiſe, Eure-et-Loire.
Meaux—Seine-et-Marne, Marne.
Orleans—Loiret, Loire-et-Cher.

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Malines—Archbiſhopric—les deux Nettes, la Dyle.
Namur—Sambre-et-Meuſe.
Tournay—Jemappe.
Aix-la-Chapelle—la Roer, Rhin-et-Moſelle.
Treves—la Sarre.
Gand—l'Eſcaut, la Lys.
Liege—Meuſe-Inferieure, Ourthe.
Mayence—Monte Tonnerre.

Beſançon—Archbiſhopric—Haute-Saone, le Doubs, le Jura.
Autun—Saone-et-Loire, la Nievre.
Metz—la Moſelle, les Forets, les Ardennes.
Straſbourg—Haut-Rhin, Bas-Rhin.
Nancy—la Meuſe, la Meurthe, les Voſges.
Dijon—Cote-d'Or, Haute-Marne.

Lyons—Archbiſhopric—le Rhone, la Loire, l'Ain.
Mende—l'Ardiche, la Lozere.
Grenoble—l'Iſere.
Valence—la Drome.
Chambery—le Mont-blanc, le Leman.

Aix—Archbiſhopric—le Var, les Bouches-du-Rhone.
Nice—Alpes Maritimes.
Avignon—Gard, Vaucluſe.
Ajaccio—le Galo, le Liamone.
Digne—Hautes-Alpes, Baſſes-Alpes.

Toulouſe—Archbiſhopric—Haute-Garonne, Ariége.
Cahors—le Lot, l'Aveyron.
Montpellier—le Herault, le Tarn.
Carcaſſonne—l'Aude, les Pyrennées.
Agen—Lot-et-Garonne, le Gers.
Bayonne—les Landes, Hautes-Pyrennées, Baſſes-Pyrennées.

Bourdeaux—Archbiſhopric—la Gironde.
Poitiers—les deux Sevres, la Vienne.
La Rochelle—la Charente Inferieure, la Vendée.
Angoulême—la Charente, la Dordogne.

Bourges—Archbiſhopric—le Cher, l'Indre.
Clermont—l'Allier, le Puy-de Dome.
Saint-Flour—la Haute-Loire, le Cantal.
Limoges—la Creuſe, la Correze, la Haute Vienne.

Tours—Archbiſhopric—Indre-et-Loire.
Le Mans—Sarthe, Mayenne.
Angers—Main-et-Loire.
Nantes—Loire-Inferieure.
Rennes—Ille-et-Villaine.
Vannes—le Morbihan.
Saint Brieux—Côtes-du-Nord.
Quimper—le Finiſterre.

Rouen—Archbiſhopric—la Seine-Inferieure.
Coutances—la Manche.
Bayeux—le Calvados.
Seez—l'Orne.
Evreux—l'Eure.

ARTICLES *relative to the Proteſtant Religion.*

TITLE I.—*General Diſpoſitions applicable to all Proteſtant Communions.*

Article 1. No individual ſhall officiate, as a miniſter of religion, who is not by birth a Frenchman.

2. Neither the Proteſtant churches nor their miniſters ſhall have any connexion with a foreign power or authority.

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3. The paſtors or miniſters of the different Proteſtant communions ſhall pray for the proſperity of the French republic and the ſafety of the conſuls.

4. No doctrinal deciſion or formality, under the title of a *confeſſion*, or under any other title, ſhall be publiſhed or become a ſubject of inſtruction before its publication has been authoriſed by the government.

5. No change ſhall take place in the forms of their diſcipline without the ſame authority.

6. The council of the ſtate ſhall take cognizance of all the plans formed by their miniſters, and of all the diſſenſions which may ariſe among them.

7. It ſhall be underſtood, that to the ſupport of paſtors of conſiſtorial churches, the property of theſe churches ſhall be applied, as well as the oblations eſtabliſhed by uſage and by poſitive regulations.

8. The regulations applied to the ſpecific articles of the Catholic worſhip reſpecting the liberty of endowments, and the nature of the property which can be the object of them, ſhall be common to the Proteſtant churches.

9. There ſhall be two academies or ſeminaries in the eaſt of France for the inſtruction of the miniſters of the confeſſion of Augſburg.

10. There ſhall be a ſeminary at Geneva for the inſtruction of the miniſters of the reformed churches.

11. The profeſſors in all the academies or ſeminaries ſhall be nominated by the chief conſul.

12. No perſon ſhall be elected a miniſter or paſtor of any church of the confeſſion of Augſburg, who has not ſtudied during a fixed period in one of the French ſeminaries appointed for miniſters of this perſuaſion, and who ſhall not produce a certificate in due form of his capacity and regular conduct during the continuance of his ſtudies.

13. No perſon is to be elected a miniſter or paſtor of the reformed church without having ſtudied in the ſeminary of Geneva, and without producing a certificate of the deſcriptions pointed out in the preceding article.

14. The regulation reſpecting the adminiſtration and internal police of theſe ſeminaries, the number and the qualifications of the profeſſors, the mode of inſtruction, the ſubjects which are taught, together with the form of the certificates of application, good conduct, and capacity, are to be approved of by the government.

TITLE II.—Sect. I. *Of the Reformed Churches.—Of the general Organization of theſe Churches.*

Art. 15. The reformed churches of France ſhall have paſtors, local conſiſtories, and ſynods.

16. There ſhall be a conſiſtorial church for every 6000 individuals of the ſame communion.

17. Five conſiſtorial churches ſhall form a ſynod.

Sect. II. *Of Paſtors and Local Conſiſtories.*

Art. 18. The conſiſtory of each church ſhall be compoſed of the paſtor or paſtors officiating in that church, and of a certain number of aged and reſpectable laymen choſen from among that claſs of citizens paying the greateſt ſhare of public contributions: their number ſhall not be under 10 nor above 12.

19. The

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19. The number of miniſters or paſtors in one conſiſtorial church ſhall not be augmented without the authority of the government.

20. The members of the conſiſtory ſhall watch over the maintenance of dicipline, the application of the property of the church, as well as the funds ariſing from charitable contributions.

21. The paſtor, or the oldeſt of the paſtors, ſhall be the preſident of the conſiſtorial aſſemblies: the office of ſecretary ſhall be filled by one of the elders.

22. The ordinary conſiſtorial aſſemblies ſhall continue to be held on the days pointed out by long practice.

The extraordinary aſſemblies ſhall not be held without the permiſſion of the ſub-prefect, or of the mayor in his abſence.

23. Every two years one half of the elders of the conſiſtory ſhall be renewed. At this period the elders in office ſhall fix upon an equal number of Proteſtant citizens, heads of families, and choſen from among thoſe paying the largeſt contribution to the ſtate in the *commune* where the conſiſtory is ſituated, and proceed to a new election: thoſe going out are capable of being re-elected.

24. In thoſe churches, where there is at preſent no conſiſtory, one ſhall be formed by the election of 25 heads of Proteſtant families paying the largeſt contributions to the ſtate. The election ſhall not take place without the authority, and unleſs in the preſence of the prefect or ſub-prefect.

25. Paſtors can only be depoſed after the reaſons of ſuch depoſition have been confirmed by the government.

26. In caſe of the deceaſe, the voluntary reſignation, or the confirmed depoſition of a paſtor, the conſiſtory ſhall, according to the 18th article, chooſe one to fill his place by a majority of voices.

The title of the election ſhall be preſented to the firſt conſul by the counſellor of ſtate intruſted with the management of religious affairs, for the purpoſe of receiving his approbation.

After this approbation is given, he cannot enter upon the exerciſe of his function till he has taken before the prefect the oath exacted of the miniſters of the Catholic worſhip.

27. All the paſtors now employed are proviſionally confirmed.

28. No church ſhall extend from one department to another.

Sect. III. *Of Synods.*

Art. 29. Each ſynod ſhall conſiſt of a paſtor and an elder from each church.

30. The ſynods ſhall ſuperintend the celebration of public worſhip, the doctrines that are taught, and the conduct of religious affairs. All their deciſions, of whatever deſcription, ſhall be ſubmitted to the approbation of government.

31. The ſynods ſhall not aſſemble without the permiſſion of government. Previous notice ſhall be given to the counſellor of ſtate intruſted with the management of religious matters, of the ſubjects which are to be diſcuſſed. The aſſembly ſhall be held in preſence of the prefect or ſub-prefect, and a copy of the minutes of the deliberations ſhall be addreſſed to the counſellor of ſtate above mentioned, who ſhall, with all poſſible ſpeed, tranſmit a report to the government.

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32. The meetings of the ſynod ſhall not be prolonged beyond ſix days.

Title III.—*Of the Organization of the Churches of the Confeſſion of Augsburg.*

Sect. I. *General Regulations.*

Art. 33. The churches of the confeſſion of Augſburg ſhall have paſtors, local conſiſtories, inſpections, and general conſiſtories.

Sect. II. *Of the Miniſters, Paſtors, and local Conſiſtories of each Church.*

Art. 34. With reſpect to paſtors, the regulation of the conſiſtorial churches, which was preſcribed by the 2d ſection of the preceding title as applicable to the reformed paſtors and churches, is to be obſerved.

Sect. III. *Of Inſpections.*

Art. 35. The churches of the confeſſion of Augſburg ſhall be ſubject to inſpections.

36. Five conſiſtorial churches ſhall form the bounds of an inſpection.

37. Each inſpection ſhall be compoſed of a miniſter and an elder from each church of the diſtrict. It ſhall not aſſemble without the permiſſion of the government. At its firſt meetings, the oldeſt of the miniſters of the diſtrict ſhall preſide. Each inſpection ſhall chooſe two laymen and one clergyman, who ſhall take the title of inſpector, and whoſe duty it ſhall be to watch over the conduct of the miniſters, and to preſerve good order in the different churches: the choice of the inſpector and the two laymen ſhall be confirmed by the firſt conſul.

38. The inſpection ſhall not aſſemble without the authority of government, in preſence of the prefect or ſub-prefect, or without having given previous intelligence to the counſellor of ſtate, whoſe buſineſs it is to watch over religious affairs, of the ſubjects that are to come under diſcuſſion.

39. The inſpector ſhall viſit the churches of his diſtrict; and he may adopt the aſſiſtance of the two laymen named with him, as often as circumſtances ſhall appear to require. He ſhall be charged with the convocation of the general aſſembly of inſpection, no decree of which, however, ſhall be put in force till it has received the approbation of the government.

Sect. IV. *Of General Conſiſtories.*

Art. 40. There ſhall be three general conſiſtories: one at Straſburg for the Proteſtants of the confeſſion of Augſburg, belonging to the departments of the Upper and Lower Rhine; the ſecond at Mentz, for thoſe of the departments of Laſſare and Mont Tonnerre; and the third at Cologne, for thoſe of the departments of the Rhine and Moſelle, and La Roer.

41. Each conſiſtory ſhall be formed of one lay preſident, of two eccleſiaſtical inſpectors, and a deputy from each inſpection: the preſident and the two eccleſiaſtical inſpectors ſhall be nominated by the chief conſul. The preſident ſhall take the ſame oath before the chief conſul, or a public functionary delegated for that purpoſe, which is impoſed upon the miniſters of the Catholic religion; the two eccleſiaſtical inſpectors and the

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lay members shall have the same oath administered to them by the president.

42. The general consistory shall not be permitted to assemble without the consent of the government, and unless in presence of the prefect or sub-prefect, and after a notification of the subjects in discussion, as described in former articles.

43. During the interval between the different meetings, there shall be a directory composed of the president, of the oldest of the two ecclesiastical inspectors, and of three laymen, one of whom shall be nominated by the chief consul; and the two others shall be chosen by the general consistory.

44. The privileges of the general consistory and the directory shall continue to be directed by the customs and regulations of the churches of the confession of Augsburg, in all points which have not been formally fixed by the laws of the republic or the present articles.

537 Bonaparte chosen consul for life.

WHEN Bonaparte was elected first consul for ten years, he was deemed competent to be re-elected for the same length of time; but he was afterwards chosen for life, with the strange power conferred upon him of nominating his successor, or, in other words, of governing beyond the grave, than which nothing can be conceived more ridiculous or unjust. Having advanced with such rapidity in the acquisition of power and authority, it was extremely natural to conclude, that the ambition of Bonaparte was not satiated, but that he would afterwards claim to himself, and influence an infatuated people to sanction, still higher degrees of dignity and grandeur. A book was accordingly published, either with his permission, or by his express command, pointing out the propriety and expediency of creating him *First Emperor of the Gauls!* At a subsequent period of the history contained in this article we shall see this extravagant proposition actually carried into effect, and Napoleon I. adorned with imperial honours. This verifies what Dumourier asserted concerning the French, at a time when such an event was highly improbable; "that a king they would have."

538 The extent of his powers.

In the capacity of first consul, his power was similar to that of his Britannic majesty, in respect of criminals under sentence of death, that he could grant them at his pleasure a plenary pardon, and admit them to return again to the bosom of society; but his executive authority in almost every other case was dangerously greater, as there was in fact no other power in the state which could possibly controul him. While his authority was established thus firmly within his own dominions, he endeavoured to increase his influence over the rest of Europe, by forming an alliance with the court of Petersburgh. At first it was believed to be purely of a commercial nature, but the active part taken by both in dismembering the Germanic body, clearly evinced that such an alliance was of a more interesting nature, notwithstanding the ostensible reason for such conduct was the indemnification of the sufferers during the war.

It will perhaps be admitted, that the state of France, after the dreadful convulsions occasioned by the revolution, required an executive government of considerable promptitude and vigour; yet it was surely possible, and it was no less a sacred duty binding upon him, to consult, in particular circumstances, the happiness and prosperity of the people much more than he did, without endangering in the smallest degree the stability of his government. The French people should not have been deprived of the many blessings resulting from a representative government; and if not ripe for it then, it should have been conferred upon them at a subsequent period. If the hero of Marengo was afraid of facing a free parliament, he thus pronounced himself a tyrant, and if unable to moderate its deliberations, very deficient in political knowledge. He might find it expedient, for instance, to impose some restraints on the licentiousness of the press; but totally to annihilate its liberty was as unjust as it was impolitic. He should have recollected a saying of an historian and philosopher, "that a whisper may circulate as rapidly as a pamphlet."

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Towards the termination of the year 1802, Bonaparte was very active in his visitations of the sea-port towns, where the most fulsome addresses were presented to him which were ever given to any mortal being. Various conjectures were formed as to the probable design of such visits. It was thought by some that he intended to conciliate the affections of the people, especially the military and the constituted authorities; others imagined that it was to make himself acquainted with the true state of public opinion; while a third class conjectured that it was with a view to increase the navy of France, and acquire an intimate knowledge of the different parts of the coast. Whatever his object was, it is more than probable that it was directed to one point, and that his complicated movements were purposely intended to mislead those who felt an interest in watching him. It is true, he made no secret of his determination to invade Great Britain; but we should greatly diminish that knowledge which he must unquestionably possess, were we to conclude that he ever seriously believed in the practicability of such an undertaking.

539 Character of Bonaparte.

His abilities as a soldier will be disputed by no man, for when viewed only in this light, he is unquestionably *great;* but it would be a most unpardonable breach of truth to call him an able politician. While he promised to restore the commerce of France, it continued to languish, more, perhaps after the restoration of peace, than during the continuance of the war. This seems to be a subject fairly beyond his comprehension. Numbers in France drew a great part of their subsistence from the expenditure of such persons from the British dominions, as were disposed, after the return of peace, to pay a visit to the metropolis of the Gallic empire. But while we thus freely animadvert on the conduct of the first consul, and point out his errors or faults without any reserve, we wish not to conceal a single circumstance which redounds to his honour. When Cambaceres, the bishop of Caen, made application to the prefect of Rouen to have the Protestant churches forcibly shut; as soon as the request of the bishop was known to Bonaparte, he sent for the second consul, and told him, that if the bishop had not been *his* brother, he would have struck him off the list. Such a reply was certainly worthy of a great man.

On the 21st of February 1803, a view of the state of France was laid before the legislative body and the tribunate, containing a comprehensive view of the relations of the republic, both with respect to colonies and foreign states; but the most important part it of had a reference

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France. 1803. to Britain, which was charged with acting improperly in retaining troops in Malta and Egypt, after the ſigning of the definitive treaty. It divided the inhabitants of it into two parties, repreſenting the one as having ſworn implacable enmity to France, and the other as anxious to maintain the relations of peace and amity, concluding with ſingular bravado, "whatever may be the ſucceſs of intrigue at London, it will never force other nations into new leagues; and the French government aſſerts, with juſt pride, that England alone cannot now contend with France."

540 Hoſtile preparations of France. It now began to be manifeſt, that the bleſſings of peace were not to be long enjoyed. The extenſive warlike preparations going forward about this time in the ports of France and Holland, rouſed the jealouſy of the Britiſh miniſtry; for although the oſtenſible reaſon was to reduce the revolted colonies to obedience, they could not help apprehending that much more was comprehended in ſuch extenſive armaments. We ſhall ſtill be more inclined to adopt this opinion, if we advert to the following circumſtance. When Bonaparte, on the 13th of March, found Lord Whitworth and M. de Marcoff ſtanding together, he addreſſed them in theſe words: "We have fought for fifteen years, and it ſeems there is a ſtorm gathering at London, which may produce another war of fifteen years more.—The king of England has ſaid, in his meſſage to the parliament, that France had prepared offenſive armaments; he has been miſtaken; there is not in the ports of France any conſiderable force, they having all ſet out for St Domingo. He ſaid there exiſted ſome differences between the two cabinets; I do not know of any. It is true that his majeſty has engaged by treaty that England ſhould evacuate Malta. It is poſſible to kill the French people, but not to intimidate them." At the concluſion of the drawing-room, it is ſaid that Bonaparte addreſſed the Britiſh envoy thus, when near the door: "The ducheſs of Dorſet has paſſed the moſt unpleaſant ſeaſon at Paris; I moſt ardently wiſh ſhe may paſs the pleaſant one alſo; but if it is true that we are to have war, the reſponſibility, both in the ſight of God and man, will be on thoſe who ſhall refuſe to execute the treaty."

Much about the ſame time a paper was inſerted in the *Hamburgh Correſpondenten*, containing much violent declamation againſt Great Britain, and believed by many to have been the production of Bonaparte. If our information be correct, the French miniſter requeſted, and obtained permiſſion, from the magiſtrates of that city to make it thus public. Some alterations were made on the manuſcript, which having given offence to the republican ambaſſador, it was, on the 30th of March, inſerted without any alterations or ſuppoſed amendments. It contains many rancorous expreſſions againſt Great Britain, while part of it ſeems to be a deſigned apology for the inſulting converſation which took place at Madame Bonaparte's drawing room already mentioned. It contains ſome reflections alſo on the freedom of diſcuſſion indulged in the Britiſh news-papers relative to the affairs of France, a circumſtance far beneath the notice of the firſt conſul, who, in this particular, did not advert to the freedom of the Britiſh preſs.

In the interior parts of France, the moſt active preparations for war continued to be made, and at the ſea-ports, the different commanders received orders to put the navy as faſt as poſſible on a reſpectable footing. Vaſt bodies of the military received orders to leave the Netherlands, and march towards the frontiers of the Batavian republic, while the ſhips deſtined for the Newfoundland fiſhery were laid under an embargo. France. 1803.

541 Diſputes concerning Malta. As the iſland of Malta was, by the treaty of Amiens, to be ſurrendered to the knights of the order of St John of Jeruſalem, upon certain conditions, De Thomaſi, the new grand maſter, ſent M. de Buſſy his lieutenant in the month of January, with full powers to demand poſſeſſion of the iſland; to which the governor, Sir Alexander Jonathan Ball, replied, that as ſome of the powers who had, by the 10th article of the treaty of Amiens, been invited to guarantee the independence of Malta, had not as yet agreed to that meaſure, he could not terminate the government of his Britannic majeſty without farther inſtructions.

As the long and tedious correſpondence carried on between Great Britain and France, by means of Lord Whitworth and M. de Talleyrand, which was laid before both houſes of parliament on the 18th of May 1803, did not terminate in ſuch a manner as the lovers of peace moſt ardently wiſhed, a freſh rupture between the two countries ſeemed unavoidable. Officers were ſent to reſide in the principal ſea-ports of Great Britain, veſted with the character of commercial agents, but they were in fact detected in founding the harbours, and in drawing plans of the ports; a glaring proof that ſome deſperate blow was meditated againſt this country.

542 Hoſtilities re-commence between Britain and France. In ſpite of the efforts of the Britiſh miniſtry to prevent a rupture, hoſtilities actually commenced on the 16th of May, and letters of marque were iſſued againſt the French republic. The ultimatum of Britain was conceived in theſe terms: "that the French government ſhould not oppoſe the ceſſion of the iſland of Lampedoſa to his Britannic majeſty; that the French forces ſhould evacuate the Batavian and the Swiſs territory; that a ſuitable proviſion ſhould be made for the king of Sardinia; and, by a ſecret article, that Britain ſhould be permitted to retain poſſeſſion of Malta for ten years." Our readers will no doubt immediately conclude, that this was rejected; but France ſtill made ſome feeble endeavours to negotiate, which appeared to the cabinet of St James's to be a pretext only to gain time, the war was conſidered as actually recommenced. All ſubjects belonging to Britain who were now found in France and Holland were arreſted and detained; an event which was ſpeedily followed by the march of a republican army towards Oſnaburgh and Hanover, the former of which was taken poſſeſſion of by General Mortier on the 26th of May, after which he took the town of Bentheim, and the Hanoverian garriſon were made priſoners of war. Oſnaburgh was abandoned by the Hanoverians on the 28th, and two days after the French got poſſeſſion of Quackenbrook. His royal highneſs the duke of Cambridge was determined to ſtand or fall with the electorate; but as he was at the head of no more than a handful of troops compared with the army of Mortier, the regency urged him to retire from the command, as the probability of ſucceſs was entirely againſt him. The duke, therefore, returned to Bremen, and reached Yarmouth on the 13th of June, along with Prince William of Glouceſter.

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Much about this period, General Mortier was waited upon by deputies from the regency, both of a civil and military nature, who begged that he would ſuſpend his march, and propoſed a capitulation. By this the Hanoverian troops were permitted to ſurrender on their parole, and agreed not to take up arms againſt France during the continuance of the war. Sums were to be raiſed for maintaining the republican army, while private property was to be held ſacred.

If this promiſe, however, was really made, it does not appear that it was conſidered as binding, for it has been ſaid that more flagrant acts of cruelty and injuſtice were ſcarcely ever perpetrated by people profeſſing to be civilized. The following, we are told, is part of the information upon this ſubject communicated by private letters. "In the city of Hanover, and even in the public ſtreets, women of the higheſt rank have been violated by the loweſt of the brutal ſoldiery, in the preſence of their huſbands and fathers, and ſubjected at the ſame time to ſuch additional and undeſcribable outrages, as the brutal fury of the violators, inflamed by drunkenneſs, could contrive. Nor have we heard that the philoſophers of Goettingen, the enthuſiaſts of equality and perfectibility, have been at all better treated." We ſuſpect that this picture is too highly coloured; yet, if a thouſandth part of the narration be true, of which we have only ſelected a ſpecimen, we muſt allow it to be an indelible ſtigma on the French nation.

543 Bonaparte labours to ruin Britiſh commerce.

It had always been a favourite object with Bonaparte, to do as much injury as poſſible to the commerce of Great Britain, and therefore he now determined to ſhut againſt this country the ports of the Weſer and the Elbe; and alſo inſiſted on the ports of Denmark being ſhut againſt veſſels belonging to Britain, propoſing to plant a French garriſon in the city of Copenhagen, while the other powers of Europe ſeemed to behold his conduct with indifference or ſtupefaction. The French having put themſelves in poſſeſſion of the excluſive navigation of the Elbe, Great Britain determined to blockade it with ſhips of war, as a report then prevailed that Bonaparte would make uſe of that port for the purpoſe of invading Scotland. In this view of the matter, the conduct of Britain was highly commendable.

About this time the French army in St Domingo was in a moſt melancholy condition, as appeared from the information contained in ſome intercepted letters. Although about 10,000 men reached the iſland, in three months after General Rochambeau's arrival, when they were landed in the different ports, ſcarcely any traces of a reinforcement could be perecived, ſo much had his army ſuffered. The atrocities of the troops in their turn were alſo ſaid to be great, and complaints made to the commanding officers were anſwered with threats. It appears that Rochambeau was obliged to have recourſe to abſolute falſehood, in order to keep up the ſpirits of his troops, and allay their diſcontent; giving out, what he knew could not be the caſe, that a reinforcement of 20,000 men was daily expected.

544 Britain put in a ſtate of defence.

In the mean time, the miniſtry of Great Britain uſed every effort to place the country in a ſecure and reſpectable ſtate of defence, ſhould the inſatiable ambition of Bonaparte lead him to a ſerious attempt to invade it. The intelligent part of the people indeed believed that he never ſeriouſly intended to hazard the conſequences of what he threatened, yet it was certainly prudent to prepare for the worſt. The troops of the line were induſtriouſly and ſucceſsfully recruited, the militia were called out and kept in actual ſervice, and an army of reſerve was raiſed with the utmoſt expedition. Having almoſt 500,000 troops of different ſpecies, Britain had no juſt reaſon to apprehend an invaſion, being able to accompliſh the deſtruction of the boldeſt invader. Theſe troops were encamped along the coaſt, garriſon towns were properly ſupplied with men, the greateſt force was concentrated wherever the probability of a landing was ſtrongeſt, and care was taken of the health of the military, as well as the appointment of the ableſt generals to command them. Proviſions, ammunition, and ſtores, were collected in abundance. As it was natural to conclude that London would be the great object with an invading army, the utmoſt attention was paid to the defence of thoſe parts of the coaſt which are moſt adjacent to it.

France. 1803.

Similar efforts were made to annoy the enemy by ſea, and render their deſigns wholly abortive. To Lord Keith and Admiral Montague was entruſted the command of the channel fleet; and an attempt was made at Granville to diſconcert the preparations of France, by a detachment of ſhips under the command of Sir James Saumarez, which was ſo far attended with ſucceſs as to intimidate the inhabitants, damage a number of houſes, and deſtroy ſome boats in the harbour. Similar attacks upon Calais and Boulogne alſo tended to convince the French reſiding on the coaſt that they were far from being ſecure, although total deſtruction was not the conſequence of ſuch exertions. Lord Nelſon then guarded the Italian ſeas, and Sir Edward Pellew and Sir Robert Calder were ſtationed off Ferrol.

545 Cruelties of the French towards the Hanoverians.

In the mean time the republican army in Hanover continued to oppreſs the inhabitants, and to devour the reſources of that electorate. The Dutch were made to ſuffer almoſt as much from their new allies and pretended friends, as the inhabitants of a conquered country. They were dragged into a war, of which they certainly wiſhed to be the unconcerned ſpectators, compelled to raiſe and maintain a large body of native troops, to receive garriſons into all their ſtrong towns, to give up their ſea-ports to the French, and expoſe their whole country as a ſcene of paſſage and encampment to the armies of the republic. Their trade was ruined, and their ports blocked up by the Britiſh at ſea, on account of their alliance with France. The inhabitants of the Belgic provinces belonging to France were alſo ſevere ſufferers by the levies of conſcripts, the interruption which their trade and manufactures met with from the war, and the rigour by which they were governed. It was reported that the firſt conſul had 300,000 effective men in readineſs along the coaſt and the places adjacent, and that 2800 men were inceſſantly employed, augmenting and repairing the fortifications at Boulogne.

546 The Britiſh coaſts are fortified.

During the month of November 1803, the ſea-coaſts of Great Britain and Ireland received freſh additions of ſtrength, that if ever troops from France ſhould dare to attempt a landing, they might be aſſured of meeting with a warm reception. The garriſon of Plymouth was augmented to 13,700 landmen, beſides 1500 ſeamen and marines. A battery was erected at Paul Point, for the defence of the Humber, and two others were to be built oppoſite to it in Lincolnſhire. Exertions equally ſpirited were continued by ſea. Sir Sidney Smith cruiſed

France. 1804.

ed off the Texel, and drove on ſhore on the coaſt of Holland, 12 armed ſhips of the enemy, three of which were captured. During the month of February 1804, the French and Dutch ports continued to be blockaded by the Britiſh navy with the utmoſt vigilance, a meaſure which the tempeſtuous nature of the weather frequently rendered hazardous. The preparations for an invaſion of this country were ſtill continued on the part of France, but no force of any conſequence found it practicable to put to ſea, owing to the vigilance of our cruizers. A number of gun-boats were taken at different times off Boulogne, and different other parts of the French and Dutch coaſts, which might have convinced the people of theſe countries of the abſurdity of expecting to accompliſh any thing deciſive againſt Britain by ſuch inadequate means.

A plan was ſuggeſted for filling up the ports of the enemy with ſtones and the hulks of old veſſels, ſo as to render it difficult, if not wholly impracticable, either for ſhips or ſmall craft to make their way out of them. The idea ſeems to have been taken from a fact well known, that harbours have been often ruined by the tides and currents of the ſea, the depoſition of ſand from rivers, earthquakes, and other accidents; and therefore it was concluded that ſimilar effects might be produced by artificial means. The accompliſhment of ſuch an object, if it were practicable, would be an ample compenſation for the greateſt expence.

It was the opinion of the diſcerning part of mankind, long before it happened, that the ambition of Bonaparte would not always remain ſatisfied with the dignity of firſt conſul, even for life; for although he could receive no freſh additions to his power and influence, yet there was reaſon to believe that the ſound of ſuch titles as have always been deemed higher and more dignified ſtill, would be too faſcinating for him to reſiſt. Accordingly, on the 25th of April 1804, the following decree was iſſued by the tribunate of France.

"The tribunate, conſidering that at the breaking out of the revolution, when the national will had an opportunity of manifeſting itſelf with the greateſt freedom, the general wiſh was declared for the individual unity of the ſupreme power, and for the hereditary ſucceſſion of that power:

"That the family of the Bourbons, having by their conduct rendered the hereditary government odious to the people, forced them to loſe ſight of its advantages, and drove the nation to ſeek for a happier deſtiny in a democratical form of government:

"That France having made a trial of different forms of government, experienced from theſe trials only the miſeries of anarchy:

"That the ſtate was in the greateſt peril, when Bonaparte, brought back by providence, ſuddenly appeared for its ſalvation:

"That the conſulſhip for life, and the power granted to the firſt conſul of appointing his ſucceſſor, are not adequate to the prevention of intrigues at home or abroad, which could not fail to be formed during the vacancy of the ſupreme power:

"That in declaring that magiſtracy hereditary, conformity is obſerved at once to the example of all great ſtates, ancient or modern, and the firſt wiſh of the nation, expreſſed in 1789:

"That, enlightened and ſupported by this experience, the nation now returns to this wiſh more ſtrongly than ever, and expreſſes it on all ſides:

"That when France demands for her ſecurity an hereditary chief, her gratitude and affection call on Bonaparte:

"That France may expect from the family of Bonaparte, more than from any other, the maintenance of the rights and liberty of the people:

"That there is no title more ſuitable to the glory of Bonaparte, and to the dignity of the ſupreme chief of the French nation, than the title of emperor.

"The tribunate have come to the following vote:

"That Napoleon Bonaparte, the firſt conſul, be proclaimed emperor of the French, and in that capacity be inveſted with the government of the French republic:

"That the title of emperor and the imperial power be made hereditary in his family in the male line, according to the order of primogeniture."

The foregoing decree having been put to the vote, it was carried by acclamation, with the ſingle exception of the only member (Carnot), who delivered his ſentiments againſt its adoption.

The ſenate preſented an addreſs to the firſt conſul, in which they took great pains to convince him that the ſafety of France, and the happineſs of Europe, depended entirely upon his acceptance of the title of Emperor of the French, and upon its being made hereditary in his illuſtrious family. The different diviſions of the army of courſe ſent addreſſes to the firſt conſul, intreating him to condeſcend to become emperor of France.

Bonaparte requeſted them, in his anſwer, "to make known to him the whole of their thoughts." The ſenate then deſired him to take the imperial and hereditary dignity. Bonaparte conſented.

547 Bonaparte is made emperor of France.

An addreſs was preſented by the ſenate to the firſt conſul, in which they employed many arguments to convince him (they might have ſpared themſelves the trouble) that the preſervation of France, and the repoſe of all Europe turned on his acceptance of the dignified title of the emperor of the French, which right to be hereditary in his auguſt family. The different diviſions of the army hoped alſo that he would be graciouſly pleaſed to *condeſcend* (what an inſtance of humility!) to become emperor of France. Whether or not it may excite the aſtoniſhment of our readers, we can aſſure them upon the moſt undoubted authority, that he was ſo *humble* as to accept of it, and the following is his addreſs to the conſervative ſenate.

"SENATORS,

"Your addreſs of the 6th laſt Germinal has never ceaſed to be preſent to my thoughts. It has been the object of my moſt conſtant meditation.

"You have judged the hereditary power of the ſupreme magiſtracy neceſſary, in order to ſhelter the French people completely from the plots of our enemies, and from the agitations which ariſe from rival ambitions. It even appears to you, that many of our inſtitutions ought to be improved, in order to ſecure for ever the triumph of equality and public liberty, and preſent to the nation and to the government the double guarantee they are in want of.

"In proportion as I fix my attention upon theſe great objects,

France. 1804.

objects, I am ſtill more convinced of the verity of thoſe ſentiments which I have expreſſed to you, and I feel more and more, that in a circumſtance as new as it is important, the councils of your wiſdom and experience were neceſſary to enable me to fix my ideas.

"I requeſt you then to make known to me the whole of your thoughts.

"The French people can add nothing to the honour and glory with which it has ſurrounded me; but the moſt ſacred duty for me, as it is the deareſt to my heart, *is to ſecure to its lateſt poſterity* thoſe advantages which it has acquired by a revolution that has coſt it ſo much, particularly by the ſacrifice of thoſe millions of brave citizens who have died in defence of their rights. Fifteen years have paſt ſince, by a ſpontaneous movement you ran to arms, you acquired liberty, equality, and glory. Theſe firſt bleſſings of nations are now ſecured to you for ever, are ſheltered from every tempeſt, they are preſerved to you and your children; inſtitutions conceived and begun in the midſt of the ſtorms of interior and exterior wars, developed with conſtancy, are juſt terminated in the noiſe of the attempts and plots of our moſt mortal enemies, by the adoption of every thing which the experience of centuries and of nations has demonſtrated as proper to guarantee the rights which the nation had judged neceſſary for its dignity, its liberty, and its happineſs."

The new emperor was allowed to adopt the children or grand-children of his brothers, if arrived at the age of 18 years complete, and he without legitimate children of his own; but this privilege cannot be enjoyed by his ſucceſſors. Failing both legitimate and adopted heirs, the crown ſhall be enjoyed by Joſeph Bonaparte and his deſcendants; and failing Joſeph and his deſcendants, it ſhall devolve on Louis Bonaparte and his deſcendants, &c. If a ſucceſſor cannot be found in any of theſe channels, a *Senatus conſultum*, propoſed to the ſenate by the dignities (we preſume it ſhould have been dignitaries) of the empire, and ſubmitted for the acceptance of the people, ſhall nominate an emperor. It was alſo decreed that the members of the imperial family ſhould be called French princes, and the eldeſt ſon of the family, the imperial prince. Among other things it was enacted, that every emperor, two years after he comes to the throne, ſhall ſwear to maintain the integrity of the territory of the French republic! We have mentioned this laſt circumſtance, wholly for this reaſon, that *the emperor of a republic* is no doubt a rarity to the greater part of our readers.

548 Trial of ſtate priſoners in France.

The trial of the ſtate priſoners commenced at Paris on the 29th of May 1804. They were charged with conſpiring againſt the life and government of Bonaparte; but how great was our aſtoniſhment to find the juſtly celebrated General Moreau included in the number! Envy and jealouſy of Bonaparte can alone have implicated this great man in ſuch a charge, as he was heard to ſay on the arrival of the new emperor from Egypt;—"this is the man who is neceſſary to ſave France." Georges with 11 of his aſſociates, were condemned and executed on the 25th of June; the gallant Moreau and four more, were ſentenced to ſuffer two years impriſonment, and about 18 were acquitted. Some of thoſe who were condemned were afterwards pardoned by imperial clemency, moved by the faſcinating charms of female eloquence and female tears.

The ſentence of impriſonment againſt Moreau was commuted to baniſhment for life to the United States of America. France. 1805.

549 Coronation of Bonaparte.

The coronation of Bonaparte took place in the month of December 1804, which was accompanied on the part of the people by ſuch demonſtrations of apparent ſatisfaction as evinced the degraded ſtate of the public mind in that unfortunate country. After receiving a number of the moſt fulſome ſpeeches, filled entirely with bombaſt and falſehood, his imperial majeſty delivered the following addreſs. "I aſcend the throne, to which the unanimous wiſhes of the ſenate, the people, and the army have called me, with a heart penetrated with the great *deſtinies* of that people, whom, from the midſt of camps, I firſt ſaluted with the name of Great. From my youth, my thoughts have been ſolely fixed upon them (ſo it appears); and I muſt add here, that my pleaſures and my pains are derived entirely from the happineſs or miſery of my people. My deſcendants ſhall long preſerve this throne (a very bold prediction). In the field they will be the firſt ſoldiers of the army, ſacrificing their lives for the defence of their country. As magiſtrates they will never forget, that contempt of the laws, and the confuſion of ſocial order, are only the reſult of the imbecility and uncertainty of princes. You, ſenators, whoſe counſels and ſupport have never failed me in the moſt difficult circumſtances, your ſpirit will be handed down to your ſucceſſors. Be ever the prop and firſt counſellors of that throne, ſo neceſſary to the welfare of this vaſt empire."

550 Who writes a letter to his Britannic majeſty on the ſubject of peace.

On the 4th of February 1805, a letter written by Bonaparte to his Britannic majeſty on the ſubject of peace, was laid before the legiſlative body by the counſellors of ſtate, in which he obſerved that providence, the ſenate, the people, and the army, had called him to the throne of France. He admitted that the two countries, over which they preſided as the chief magiſtrates, might contend againſt each other for ages, but denied that it was for the intereſt of either to continue the conteſt. He requeſted his Britannic majeſty not to deny himſelf the inexpreſſible felicity of giving peace to the world; for ſhould the preſent moment be loſt, he did not ſee how all his efforts would be able to terminate the war, which he conſidered as without any object or preſumable reſult. He concluded with obſerving that reaſon is ſufficiently powerful to diſcover means of reconciling every thing, when the wiſh of reconciliation exiſts on both ſides. On the 16th of the ſame month, a very ſplendid entertainment was given to the emperor and empreſs by the city of Paris.

551 The memorable battle of Trafalgar, in which Lord Nelſon fell.

Never was any naval victory more glorious or deciſive than that which was gained by the Britiſh under Vice-admiral Lord Nelſon over the combined fleets of France and Spain, off Cape Trafalgar, on the 21ſt October 1805. The Britiſh commander in chief gave the ſignal for bearing up in two columns as they formed in the order of ſailing, a mode of attack which had been previouſly ordered by his lordſhip, to prevent the delay and inconvenience of forming the line of battle in the manner uſually adopted. The fleet of the enemy conſiſted of 33 ſhips, under the command of the French admiral Villeneuve. The Spaniſh diviſion under Admiral Gravina, formed the line of battle with great coolneſs and ſkill, the heads of the ſhips being turned to the northward. The manner of attack was uncom-

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France. 1805.

mon, and the formation of their line was consequently new. Few signals were necessary from the commander of the British fleet, because the flag officers and captains were made previously acquainted with the admiral's whole plan. The weather column was led by the commander in chief, on board the Victory, and Lord Collingwood in the Royal Sovereign took charge of the leeward division. The leading ships of the British columns breaking through the enemy's line, was the signal for commencing hostilities, which began about 12 o'clock. The ships of the enemy were fought in such a manner as did the highest honour to the officers by whom they were commanded, but they opposed a force which was not to be vanquished. About 3 o'clock in the afternoon the enemy's line gave way, many of their ships having struck their colours. Admiral Gravina then steered for Cadiz; and 19 sail of the line, of which two were first rates, fell into the hands of the victors, and three flag-officers, Villeneuve, Don Ignatia Maria D'Aliva, and Don Baltazar Hidalgo Cisneros, were made prisoners.

552 Germany is overrun by Bonaparte.

About the same time that the British navy acquired the most signal victory over the combined fleets of France and Spain, the emperor Napoleon was carrying his victorious arms through the heart of Germany, and forcing the emperor of that country to abandon his metropolis. He left Paris on the 24th of September 1805, to join the grand army, and reached Strasburgh on the 26th, accompanied by the empress. Here he issued a manifesto to his army, in which he mentioned the commencement of the war of what he termed the *third coalition*, which he said was created and maintained by the gold and hatred of England. He declared he would fight till he had secured the independence of the Germanic body, and never again make peace without sufficient security of its continuance. He crossed the Rhine at Kehl on the 1st of October, and on the evening of the same day arrived at Ettlingen, where the elector of Baden was presented to him, along with his two sons. On the 2d he went to Stutgard, where the elector (now king) of Wirtemberg received him in the most magnificent manner, and the city was illuminated. The king of Wirtemberg agreed to furnish 6000 men for the assistance of France, and the elector of Baden 4000.

The French armies on the coast reached the banks of the Rhine in the month of September, and crossed that river on the 25th. General Bernadotte reached Franconia on the 23d, where he was joined by the Bavarian army of 20,000 infantry and cavalry; by the army of Holland under Marmont, and the Batavian division. This army of Bernadotte, about 40,000 strong, constituted the fifth division of the grand or imperial French army. It is remarkable that these three great men, Jourdan, Lecourbe, and Macdonald, were not employed; the reason assigned for which measure is, that Bonaparte suspected them of disloyalty ever since the condemnation of that singular officer Moreau. Bernadotte marched directly for the Danube on the 2d of October, and took a position at Ingolstadt. The rapidity with which the French forces moved seems to have disconcerted the Austrian commander completely, as no movements were made to oppose their progress.

Hostilities commenced on the 7th, when the Austrians were defeated with the loss of many killed, wounded, and prisoners, in attempting to oppose the passage of General Vandamme across the bridge of Donawert. Field-marshal Auffenberg, while on his march to Ulm, was completely surrounded by the French, and obliged to surrender. It is said that the Austrians here lost two colonels, five majors, 60 officers, and 4000 men made prisoners. Memmingen surrendered on the 14th to Marshal Soult, after which he marched on to Biberach, in order to cut off the retreat of the Austrians by that road. Marshal Ney crossed the Danube, and made an attack upon Elchingen a little above Ulm. The Austrians made a sortie, but were driven back to their entrenchments before Ulm, with the loss, it is said, of 3000 men taken prisoners; and at Langenau their loss amounted to the same number, in an action with Prince Murat, who commanded the cavalry. This officer again brought them to action on the 17th, when their loss was computed at 1000 men, and next day General Werneck's division was obliged to capitulate. From Albeck to Nuremberg, Murat is said to have got possession of 1500 waggons and 16,000 prisoners; but Prince Ferdinand effected his escape.

553 Surrender of Ulm.

Ulm surrendered by capitulation on the 17th, and this unaccountable step was taken by General Mack, because Berthier assured him that the Austrians were on the other side of the Inn; that Lannes was in pursuit of Prince Ferdinand; that Werneck had capitulated, and that it was impossible for any succours to reach Ulm. After the surrender of this place, the Austrian generals who were made prisoners, were sent under an escort through Bavaria to Vienna, and Mack was entrusted with some proposals to the emperor of Germany.

554 The French enter Vienna.

On the 28th of October a spirited proclamation was issued by the emperor at Vienna, declaring that the views of Austria and Russia were extremely moderate, and execrating the designs and views of Bonaparte. Every division of the French army, except that under General Ney, crossed the river Inn on the 1st of November. Bonaparte himself was with the right wing at Saltsburgh; and the centre, commanded by Prince Murat, marched towards Lintz with uncommon rapidity. The Austro-Russian army retreated to Maelk (50 miles from Vienna) as the enemy advanced. The Austrians and Russians made no stand between the Ens and Vienna, which latter place the French entered on the 12th of October. Bonaparte arrived on the 13th, and took up his quarters in the palace of Schoenbrun, about two miles from the city of Vienna. The French troops conducted themselves with the utmost propriety and decorum, which prevented any disturbance from taking place in the metropolis.

555 The dreadful battle of Austerlitz.

On the 27th November, as Bonaparte perceived the dreadful carnage which was inevitable from the conflict of two such prodigious armies as that of the allies and his own, was extremely anxious to spare the effusion of human blood, and for this purpose he proposed an armistice, which was rejected with disdain. It was not long before Bonaparte discovered that the allies were acting from presumption, want of consideration, and imprudence, of which circumstances he was but too well qualified to take advantage. At sunrise the battle commenced, and a tremendous cannonade took place along the whole line. It is almost needless to remark, that 200 pieces of cannon and 200,000 men made a

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France. 1805. most tremendous noiſe. In leſs than an hour the whole left wing of the allies was cut off, their right being by that time at Auſterlitz, the head quarters of the Ruſſian and Auſtrian emperors. From the heights of this place the emperors witneſſed the total defeat of the Ruſſians by the French guard. The loſs ſuſtained by the allies during the whole of this battle was eſtimated at 150 pieces of cannon, with 45 ſtand of colours, and 18,000 Ruſſians, and 600 Auſtrians were left dead on the field. On the 5th of December an interview took place between the emperors of Auſtria and France, which laſted for two hours. An armiſtice was mutually agreed to, which was to ſerve as the baſis of a definitive treaty. The emperor of Ruſſia was comprehended in this armiſtice, on condition of marching home his army in ſuch a manner as the emperor Napoleon might think proper to preſcribe. By virtue of the treaty of peace, the French agreed to evacuate Brunn on the 4th of January, Vienna on the 10th, and the whole Auſtrian ſtates in fix weeks after the ſigning of the treaty, except ſuch as were ceded to Italy and Bavaria.

556 The French account contradicted by the Ruſſians. It is certain, however, that the loſs of the Ruſſians in this terrible conflict was declared by the court of Peterſburgh to have been ſhockingly exaggerated by the French bulletins, which made the allied army amount to 105,000, while it appears that the Ruſſians were only 52,000 ſtrong, and the Auſtrians 17,000. According to the Ruſſian ſtatement, they had not a deficit of more than 17,000 men after that memorable battle, while the French papers made it 35,000 men killed on the field and taken priſoners, independent of 20,000 who were drowned. Which of theſe contradictory reports is to be believed, we ſhall leave entirely to the judgment of our readers, who will probably think with us, that the one is perhaps too much diminiſhed, and the other rather exaggerated.

557 Reflections on the conduct of the king of Pruſſia. It would have required the invincible modeſty of a Waſhington, not to be elated with the extraordinary ſucceſs, which attended the arms of Bonaparte in this laſt attack upon Germany;—a qualification which he ſeems never to have poſſeſſed. After the battle of Auſterlitz, his conduct was of conſequence marked with the moſt horrid injuſtice, tyranny, and rapine, both with reſpect to Hanover and the unfortunate king of Naples. The unexpected turn which the iſſue of that battle gave to continental affairs, likewiſe changed the ſentiments of the cautious, the intriguing, and myſterious king of Pruſſia, on whoſe co-operation the allies at a former period had certainly ſome reaſon to calculate, although it does not appear that he was ever ſerious in his profeſſions of attachment to the intereſt of Britain. He could drain her coffers without granting her that effectual aſſiſtance which he ſcrupled not to promiſe, but which he never intended to confer. Indeed it muſt be confeſſed, that after the battle of Auſterlitz, when both Auſtria and Ruſſia were humbled by the Corſican uſurper, it would have been madneſs in Frederick to aim a blow againſt France; but why not aim it before, when in all probability it would have been eminently ſucceſsful; We admire the king who wiſhes to make his ſubjects happy, by keeping war at a diſtance from them as much as poſſible; but we deteſt that ſovereign as the worſt of ſwindlers, who receives payment for ſuch aſſiſtance to other nations againſt their inſatiable enemies as he never deſigns to grant.

France. 1805. The troops of his Pruſſian majeſty took poſſeſſion of Hanover; and the country of Anſpach was ceded to the king of Bavaria, who received his royalty from the hands of Napoleon I. The king of Naples took refuge in Sicily, hoping there to be protected from the vengeance of the ſelf-elected monarch of France, by the united exertions of the naval force of England, Ruſſia, and Sicily. His Neapolitan majeſty no doubt often violated the treaties which he made with France; but it ought in charity to be remembered, that theſe treaties were made under the impulſe of fear, the proſpect of impending deſtruction, and to prevent a band of robbers from plundering both him and his ſubjects of their laſt ſhilling. When the affairs of the continent at any time wore a more favourable aſpect, he no doubt trampled on ſuch extorted treaties, in the hope of regaining that of which he had been unjuſtly deprived; and under ſuch circumſtances even juſtice itſelf cannot condemn him, and the dictates of humanity commiſerate his misfortunes.

558 Admiral Duckworth defeats a French ſquadron in the Weſt Indies. While the arms of Bonaparte were victorious in Europe, his naval force in the Weſt Indies received a freſh proof that Britain reigns triumphant on the ſeas. A ſquadron under the command of Admiral Duckworth, engaged and deſtroyed a French ſquadron on the 7th of February, about 36 miles from the town of St Domingo. Three of them, one of 84, and two of 74 guns, were taken by the gallant admiral; three of them made their eſcape, and two of them were committed to the flames, viz. of 84, and other of 120 guns. The loſs ſuſtained by the Britiſh on this occaſion was comparatively ſmall, conſidering the advantages of the conqueſt, the total amount of the ſlain being 74, and of wounded 264. Much about the ſame time the important news of the ſurrender of the Cape of Good Hope arrived in Britain, an expedition which had been wiſely entruſted with Admiral Sir Home Popham, and General Sir David Baird.

From the humbled ſituation of the emperor of Germany after the memorable battle of Auſterlitz, it was natural to expect that he would feel it his intereſt to make peace with the French emperor, and therefore we ſhall lay before our readers the treaty of Preſburg, which was ſigned and ratified on the 26th and 27th of December, 1805. It conſiſts of twenty-three articles, and forms no bad ſpecimen of the kind of treaties the powers of Europe have to expect from Bonaparte, when the fortune of war enables him to dictate the terms.

Treaty of Peace between Auſtria and France.

His majeſty the emperor of Germany and Auſtria, and his majeſty the emperor of the French, king of Italy, equally animated with a deſire to put an end to the calamities of war, have reſolved to proceed without delay to the concluſion of a definitive treaty of peace. This treaty contains 24 articles, of which the following are the principal, and indeed the only ones that are intereſting to thoſe ſtates who are not immediately concerned in the treaty.

Article 1. There ſhall be from the date of this day, peace and friendſhip between his majeſty the emperor of

France. 1805.

of Germany and Auſtria, and his majeſty the emperor of the French, king of Italy, their heirs and ſucceſſors, their ſtates and ſubjects reſpectively, for ever.

2. France ſhall continue to poſſeſs in property and ſovereignty the duchies, principalities, lordſhips, and territories beyond the Alps, which were before the preſent treaty united and incorporated with the French empire, or governed by the laws and government of France.

3. The emperor of Germany and Auſtria, for himſelf, his heirs, and ſucceſſors, recognizes the diſpoſitions made by his majeſty the emperor of France, king of Italy, relative to the principalities of Lucca and Piombino.

4. The emperor of Germany and Auſtria renounces, as well for himſelf as for his heirs and ſucceſſors, that part of the ſtates of the republic of Venice, ceded to him by the treaties of Campo Formio and Luneville, ſhall be united in perpetuity to the king of Italy.

5. The emperor of Germany and of Auſtria acknowledges his majeſty the emperor of the French as king of Italy; but it is agreed that, in conformity with the declaration made by his majeſty the emperor of the French, at the moment when he took the crown of Italy, that as ſoon as the parties named in that declaration ſhall have fulfilled the conditions therein expreſſed, the crowns of France and Italy ſhall be ſeparated for ever, and cannot in any caſe be united on the ſame head. His majeſty the emperor of Germany binds himſelf to acknowledge, on the ſeparation, the ſucceſſor his majeſty the emperor of the French ſhall appoint to himſelf as king of Italy.

6. The preſent treaty of peace is declared to comprehend their moſt ſerene highneſſes the electors of Bavaria, Wirtemberg, and Baden, and the Batavian republic, allies of his majeſty the emperor of the French, in the preſent war.

7. The electors of Bavaria and Wirtemberg having taken the title of king, without ceaſing nevertheleſs to belong to the Germanic confederation, his majeſty the emperor of Germany and Auſtria acknowledges them in that character.

8. His majeſty the emperor of Germany and Auſtria, as well for himſelf, his heirs and ſucceſſors, as for the princes of his houſe, their heirs and ſucceſſors reſpectively, renounces certain principalities, lordſhips, domains, and territories. [Theſe are ſpecified in the treaty, which declares alſo by whom they are hereafter to be held].

14. Their majeſties the kings of Bavaria and Wirtemberg, and his moſt ſerene highneſs the elector of Baden, ſhall enjoy over the territories ceded, as well as over their ancient eſtates, the plenitude of ſovereignty, and all the rights reſulting from it, which have been guaranteed to them by his majeſty the emperor of the French, king of Italy, in the ſame manner as his majeſty the emperor of Germany and Auſtria, and his majeſty the king of Pruſſia, over their German ſtates. His majeſty the emperor of Germany and Auſtria, both as chief of the empire, and as co-eſtates, engages himſelf not to oppoſe any obſtacle to the execution of the acts which they may have made, or will make, in conſequence.

15. His majeſty the emperor of Germany and Auſtria, as well for himſelf, his heirs and ſucceſſors, as for the princes of his houſe, their heirs and ſucceſſors, renounces all the rights, as well of ſovereignty as of paramount right to all pretenſions whatſoever, actual or eventual, on all the ſtates, without exception, of their majeſties the kings of Bavaria and Wirtemberg, and of his moſt ſerene highneſs the elector of Baden, and generally on all the ſtates, domains, and territories, compriſed in the circles of Bavaria, Franconia, and Swabia, as well as to every title taken from the ſaid domains and territories; and reciprocally, all pretenſions, actual or eventual, of the ſaid ſtates, to the charge of the houſe of Auſtria, or its princes, are, and ſhall be, for ever extinguiſhed.

17. His majeſty the emperor Napoleon guarantees the integrity of the empire of Auſtria in the ſtate in which it ſhall be in conſequence of the preſent treaty of peace.

18. The high contracting parties acknowledge the independence of the Helvetic republic, as eſtabliſhed by the act of mediation, as well as the independence of the Batavian republic.

20. All commercial communications and relations are re-eſtabliſhed in the two countries on the ſame footing as before the war.

21. His majeſty the emperor of Germany and Auſtria, and his majeſty the emperor of the French, king of Italy, ſhall maintain between them the ſame ceremonial as to rank and etiquette as was obſerved before the preſent war.

23. Immediately after the exchange of the ratification of the preſent treaty, commiſſaries ſhall be named on both ſides to give up and to receive in the names of their reſpective ſovereigns, all parts of the Venetian territory not occupied by the troops of his majeſty the emperor of the French and king of Italy. The city of Venice, the Lagunes, and the poſſeſſion of Terra Firma, ſhall be given up in the ſpace of 15 days; Venetian Iſtria, and Dalmatia, the mouths of the Cattaro, the Venetian iſles in the Adriatic, and all the places and forts which they contain, in the ſpace of ſix weeks from the exchange of the ratifications. The reſpective commiſſaries will take care that the ſeparation of the artillery belonging to the republic of Venice from the Auſtrian artillery be exactly made, the former being to remain entirely to the kingdom of Italy.

Done and ſigned at Preſburg the 26th of December, 1805.

(Signed) CH. MAUR. TALLEYRAND. (L. S.)
(Signed) JOHN Prince of LICHTENSTEIN, (L. S.)
(Signed) IGNAG, Count DE GUYLAI.

We have approved, and do approve, the above treaty, in all and each of its articles therein contained; we declare, that it is accepted, ratified, and confirmed; and we promiſe, that it ſhall be inviolably obſerved. In faith of which, we have given theſe preſents, ſigned with our hand, counterſigned, and ſealed with our imperial ſeal.

At the palace of Schoenbrun, 27th December, 1805.
By the emperor, NAPOLEON, &c.

The following brief recapitulation by Bertrand de Moleville of the various revolutions which have agita-

France. ted France during a period of more than 15 years will, it is hoped, from its conciſeneſs and perſpicuity, be acceptable to our readers; and with this we conclude our hiſtorical detail of theſe remarkable events.

559 Riſe and progreſs of the revolution.

"Popular inſurrections, and an army (ſays the author), have hitherto been the uſual means, or chief inſtruments, of every revolution; but thoſe inſurrections being of the moſt ignorant and unthinking claſs of the people, were always fomented by a certain number of factious men, devoted to, and dependent upon, ſome ambitious chief, daring, brave, of military talents, ſole and abſolute conductor of every ſtep of the revolt, and maſter of all the means of the inſurrection. In the hands of this chief, the ſoldiers, or people armed, were but machines, which he ſet in motion or reſtrained according to his pleaſure, and of which he always made uſe to put an end to revolutionary diſorders and crimes, as ſoon as the object of the revolution was gained. So Cæſar and Cromwell, after they had uſurped the ſupreme power, loſt no time in ſecuring it to themſelves, by placing it on the baſis of a wiſe and well-regulated government; and they employed, in quelling the troubles that had favoured their uſurpation, thoſe very legions, that ſame army, which they had uſed to excite them.

"This was not the caſe in France: there, the revolution, or rather the firſt of thoſe it experienced, and of which the others were the inevitable conſequence, was not, whatever be ſuppoſed, the reſult of a conſpiracy, or preconcerted plan, to overturn the throne, or to place an uſurper upon it. It was unexpectedly engendered by a commixture of weakneſs, ignorance, negligence, and numberleſs errors in the government. The ſtates-general, however imprudent their convocation may have been, would have produced only uſeful reforms, if they had found the limits of their power marked out by a hand ſufficiently firm to have kept them within that extent. It was, however, but too evident that, even before their opening, they were dreaded, and that conſequently they might attempt whatever they pleaſed. From that time, under the name of *clubs*, various aſſociations and factions ſprang up; ſome more violent than others, but all tending to the ſubverſion of the exiſting government, without agreeing upon the form of that which was to be ſubſtituted: and at that juncture alſo the projects of the faction, whoſe views were to have the duke of Orleans appointed lieutenant-general of the kingdom, began to appear.

"This faction, or more properly this conſpiracy, was indeed of the ſame nature as thoſe that had produced all former revolutions, and might have been attended with the ſame conſequences, had the duke of Orleans been poſſeſſed of that energy of character, that bravery and daring ſpirit, requiſite in the leader of a party. The people had already declared in his favour, and he might very eaſily have corrupted and brought over a great part of the army, had he been equal to the command of it: but, on the very firſt occaſion of perſonal riſk, he diſcovered ſuch cowardice and meanneſs, that he defeated his own conſpiracy, and convinced all thoſe who had entered into it, that it was impoſſible to continue the revolution, either in his favour or in conjunction with him. The enthuſiaſm the people had felt for him ended with the efforts of thoſe who had excited it.

France. "M. Necker, whom the multitude had aſſociated with him in their homage, ſtill preſerved for ſome time his adorers, and that little cabal which was for ever exalting him to the ſkies. But as he was inferior even to the duke of Orleans in military talents and diſpoſitions, he was as little calculated to be the leader of a revolution, or of a great conſpiracy: for which reaſon his panegyriſts then confined themſelves in their pamphlets and placards, with which the capital was overrun, to inſinuating that the only means of ſaving the ſtate was to declare M. Necker *dictator*; or at leaſt to confer upon him, under ſome title more conſiſtent with the monarchy, the authority and powers attached to that republican office. In fact, if after his diſmiſſion, in the month of July 1789, he had dared to make this a condition of his return to the miniſtry, it is more than probable that the king would have been under the neceſſity of agreeing to it, and perhaps of re-eſtabliſhing in his perſon the office of mayor of the palace. At that moment he might have demanded any thing: eight days later, he might have been refuſed every thing; and very ſoon after, he was reduced to ſneak out of the kingdom, in order to eſcape the effects of the general contempt and cenſure which he had brought upon himſelf.

"General La Fayette, who then commanded the Pariſian national guard, gathered the wrecks of all this popularity, and might have turned them to the greateſt advantage, if he had poſſeſſed 'that reſolute character and heroic judgment' of which Cardinal de Retz ſpeaks, and 'which ſerves to diſtinguiſh what is truly honourable and uſeful from what is only extraordinary, and what is extraordinary from what is impoſſible.' With the genius, talents, and ambition of Cromwell, he might have gone as great a length; with a leſs criminal ambition, he might at leaſt have made himſelf maſter of the revolution, and have directed it at his pleaſure: in a word, he might have ſecured the triumph of whatever party he ſhould have declared himſelf the leader. But as unfit for ſupporting the character of Monk as that of Cromwell, he ſoon betrayed the ſecret of his incapacity to all the world, and was diſtinguiſhed in the crowd of conſtitutional ringleaders only by his three-coloured plume, his epaulets, white horſe, and famous ſaying—'Inſurrection is the moſt ſacred of duties when oppreſſion is at its height.'

"The revolution, at the period when the faction that had begun it for the duke of Orleans became ſenſible that he was too much a coward to be the leader of it, and when La Fayette diſcovered his inability to conduct it, was too far advanced to recede or to ſtop; and it continued its progreſs, but in a line that no other revolution had taken, viz. without a military chief, without the intervention of the army, and to gain triumphs, not for any ambitious conſpirator, but for political and moral innovations of the moſt dangerous nature; the moſt ſuited to miſlead the multitude, incapable of comprehending them, and to let looſe all the paſſions. The more violent combined to deſtroy every thing: and their fatal coalition gave birth to Jacobiniſm, that terrible monſter, till then unknown, and till now not ſufficiently unmaſked. This monſter took upon itſelf alone to carry on the revolution; it directed, it executed, all the operations of it, all the exploſions, all the outrages: it everywhere appointed the moſt active

leaders,

leaders, and, as inſtruments, employed the profligates of every country. Its power far ſurpaſſed that which has been attributed to the inquiſition, and other fiery tribunals, by thoſe who have ſpoken of them with the greateſt exaggeration. Its centre was at Paris; and its rays, formed by particular clubs in every town, in every little borough, overſpread the whole ſurface of the kingdom. The conſtant correſpondence kept up between thoſe clubs and that of the capital, or, to uſe their own expreſſions, *des Sociétés populaires affiliées avec la Société mere*—' between the affiliated popular Societies and the parent Society,' was as ſecret and as ſpeedy as that of free-maſons. In a word, the Jacobin clubs had prevailed in cauſing themſelves to be looked up to as the real national repreſentation. Under that pretence they cenſured all the authorities in the moſt imperious manner; and whenever their denunciations, petitions, or addreſſes failed to produce an immediate effect, they gained their point by having recourſe to inſurrection, aſſaſſination, and fire. While Jacobiniſm thus ſubjected all France to its controul, an immenſe number of emiſſaries propagated its doctrines among foreign nations, and prepared new conqueſts for it.

"The national aſſembly, the capital, indeed we may ſay all France, was divided into three very diſtinct parties. The moſt conſiderable in number, but unhappily the weakeſt through a deficiency of plan and reſolution, was the party purely royal: it was adverſe to every kind of revolution, and was ſolely deſirous of ſome improvements, with the reform of abuſes and pecuniary privileges:—the moſt able, and moſt intriguing, was the conſtitutional party, or that which was deſirous of giving France a new monarchical conſtitution, but modified after the manner of the Engliſh, or even the American, by a houſe of repreſentatives. The third party was the moſt dangerous of all, by its daring ſpirit, by its power, and by the number of proſelytes it daily acquired in all quarters of the kingdom: it compriſed the democrats of every deſcription, from the Jacobin clubs, calling themſelves *Friends of the conſtitution*, to the anarchs and robbers.

"The democratic party, which at firſt was only auxiliary to the conſtitutional one, in the end annihilated it, and became itſelf ſubdivided into ſeveral other parties, whoſe fatal ſtruggles produced the ſubſequent revolutions, and may ſtill produce many more. But in principle, the conſtitutionaliſts and the democrats formed two diſtinct, though confederate, factions; both were deſirous of a revolution, and employed all the uſual means of accompliſhing it, except troops, which could be of no uſe to them, for neither of them had a leader to put at the head of the army. But as it was equally of importance to both that the king ſhould be deprived of the power of making uſe of it againſt them, they laboured in concert to diſorganiſe it; and the complete ſucceſs of that manœuvre was but too fully proved by the fatal iſſue of the departure of the royal family for Montmedi. The revolution then took a more daring and rapid ſtride, which was concluded by the pretended conſtitution act of 1791. The incoherence of its principles, and the defects of its inſtitutions, preſent a faithful picture of the diſunion of its authors, and of the oppoſite intereſts by which they were ſwayed. It was, properly ſpeaking, a compact between the faction of the conſtitutionaliſts and that of the democrats, in which they mutually made conceſſions and ſacrifices.

"Be that as it may, this abſurd conſtitution, the everlaſting ſource of remorſe or ſorrow to all who bore part in it, might have been got over without a ſhock, and led back to the old principles of monarchical government, if the aſſembly who framed it had not ſeparated before they witneſſed the execution of it; if, in impoſing on the king the obligation to maintain it, they had not deprived him of the power and the means; and above all, if the certain conſequence of the new mode of proceeding at the elections had not been to ſecure, in the ſecond aſſembly, a conſiderable majority of the democratic againſt the conſtitutional party.

"The ſecond aſſembly was alſo divided by three factions, the weakeſt of which was the one that wiſhed to maintain the conſtitution. The other two were for a new revolution and a republic; but they differed in this, that the former, compoſed of the Briſſotins and Girondiſts, was for effecting it gradually, by beginning with diveſting the king of popularity, and allowing the public mind time to wean itſelf from its natural attachment to monarchy; and the latter, which was the leaſt numerous, was eager to have the republic eſtabliſhed as ſoon as poſſible. Theſe two factions, having the ſame object in view, though taking different roads, were neceſſarily auxiliaries to each other; and the pamphlets, excitations to commotion, and revolutionary meaſures of both, equally tended to overthrow the conſtitution of 1791.

"Thoſe different factions, almoſt entirely compoſed of advocates, ſolicitors, apoſtate prieſts, doctors, and a few literary men, having no military chief capable of taking the command of the army, dreaded the troops, who had ſworn allegiance to the conſtitution and obedience to the king, and who moreover might be influenced by their officers, among whom there ſtill remained ſome royaliſts. The ſureſt way to get rid of all uneaſineſs on this ſubject, was to employ the army in defending the frontiers. For this purpoſe a foreign war was neceſſary, to which it was known that the king and his council were equally averſe. No more was wanting to determine the attack which was directed, almoſt at the ſame time, againſt all the miniſters, in order to compel them to retire, and to put the king under the neceſſity of appointing others more diſpoſed to ſecond the views of the parties. Unhappily this attempt was attended with all the ſucceſs they had promiſed themſelves; and one of the firſt acts of the new miniſtry was to declare war againſt the emperor. At the ſame time, the emigration that had been provoked, and which was almoſt everywhere applauded, even by the loweſt claſs of people, robbed France of the flower of the royal party, and left the king, deprived of his beſt defenders, expoſed to the ſuſpicions and inſults that ſprang from innumerable calumnies, for which the diſaſters at the beginning of the war furniſhed but too many opportunities.

"In this manner was prepared and accelerated the new revolution, which was accompliſhed on the 10th of Auguſt 1792, by the depoſition and impriſonment of the king, and by the moſt flagrant violation of the conſtitution of 1791. The latter, however, was not entirely abandoned on that day; for the project of the Girondiſts, who had laid the plot of that horrible conſpi-

France. racy, was then only to declare the king's depoſition, in order to place the prince royal upon the throne, under the guidance of a regency compoſed of their own creatures; but they were hurried away much farther than they meant to go, by the violence with which the moſt furious of the Jacobins, who took the lead in the inſurrection, conducted all their enterpriſes. The prince royal, inſtead of being crowned, was ſhut up in the Temple; and if France at that moment was not declared a republic, it was leſs owing to any remaining reſpect to the conſtitution, than to the fear the legiſlative body was in of raiſing an army againſt it, and alſo the majority of the nation, who would naturally be angry to ſee a conſtitution which ſeemed to be rendered ſecure and ſtable by ſo many oaths, thus precipitately overthrown, without their having been conſulted.

"It was on theſe conſiderations that the opinion was adopted, that a national convention ſhould be convoked, to determine the fate of royalty. Prompt in ſeizing all the means that might enſure the ſucceſs of this ſecond revolution, the aſſembly, under pretence of giving every poſſible latitude to the freedom of elections, decreed, that all its members ſhould be eligible for the national convention.

"From that moment the Girondiſts daily loſt ground, and the moſt flaming members of the democratic party, ſupported by the club of Jacobins, by the new commune of Paris, and by the tribunes, made themſelves maſters of every debate. It was of the utmoſt importance to them to rule the enſuing elections; and this was ſecured to them by the horrible conſternation which the maſſacres of the 2d of September ſtruck throughout the kingdom. The terror of being aſſaſſinated, or at leaſt cruelly treated, drove from all the primary aſſemblies, not only the royaliſts and conſtitutionaliſts, but moderate men of all parties. Of courſe, thoſe aſſemblies became entirely compoſed of the weakeſt men and the greateſt villains exiſting in France; and from among the moſt frantic of them were choſen thoſe members of the convention who were not taken from the legiſlative body. Accordingly, this third aſſembly, in the firſt quarter of an hour of their firſt ſitting, were heard ſhouting their votes for the abolition of royalty, and proclaiming the republic, upon the motion of a member who had formerly been a player.

"Such an opening but too plainly ſhewed what was to be expected from that horde of plunderers which compoſed the majority of the national convention, and of whom Robeſpierre, Danton, Marat, and the other ringleaders, formed their party. That of the Briſſotines and Girondiſts ſtill exiſted, and was the only one really republican. Theſe ſemi-wretches, glutted with the horrors already committed, ſeemed deſirous of arreſting the torrent of them, and laboured to introduce into the aſſembly the calm and moderation that were neceſſary to give the new republic a wiſe and ſolid organization. But the ſuperiority of their knowledge, talents, and eloquence, which their opponents could not diſpute, had no power over tigers thirſting for blood, who neither attended to nor ſuffered motions but of the
562 The third revolution. blackeſt tendency. No doubt they had occaſion for atrocities upon atrocities to prepare the terror-ſtruck nation to allow them to commit, in its name, the moſt execrable of all, the murder of the unfortunate Louis XVI.: and that martyrdom was neceſſary to bring about a third revolution, already brewing in the brain of Robeſpierre. Fear had greatly contributed to the two former: but this was effected by terror alone, without popular tumults, or the intervention of the armies; which, now drawn by their conqueſts beyond the frontiers, never heard any thing of the revolutions at home, till they were accompliſhed, and always obeyed the prevailing faction, by whom they were paid. France.

"By the degree of ferocity diſcovered by the members of the convention in paſſing ſentence upon the king, and in the debates relative to the conſtitution of 1793, Robeſpierre was enabled to mark which of the deputies were likely to ſecond his views, and which of them it was his part to ſacrifice.

"The people could not but with tranſport receive a conſtitution which ſeemed to realiſe the chimera of its ſovereignty, but which would only have given a kind of conſtruction to anarchy, if the execution of this new code had not been ſuſpended under the pretext, belonging in common to all acts of deſpotiſm and tyranny, of *the ſupreme law of the ſafety of the ſtate*. This ſuſpenſion was effected, by eſtabliſhing the proviſionary government, which, under the title of revolutionary government, concentrated all the powers in the national convention until there ſhould be an end to the war and all inteſtine troubles.

"Although the faction, at the head of which Robeſpierre was, had a decided majority in the aſſembly, and might conſequently have conſidered themſelves as really and excluſively exerciſing the ſovereign power, he was a demagogue of too deſpotic a nature to ſtomach even the appearance of ſharing the empire with ſo many co-ſovereigns. He greatly reduced their number, by cauſing all the powers inveſted in the national aſſembly by the decrees that had eſtabliſhed the revolutionary government, to be transferred to a committee, to which he got himſelf appointed, and where he was ſure of the ſole rule, by obtaining for colleagues men leſs daring than himſelf, though equally wicked; ſuch as Couthon, St Juſt, Barrere, and others like them. This committee, who had the aſſurance to ſtyle themſelves the *Committee of Public Safety*, very ſoon ſeized upon both the legiſlative and executive powers, and exerciſed them with the moſt ſanguinary tyranny ever yet heard of. The miniſters were merely their clerks; and the ſubjugated aſſembly, without murmur or objection, paſſed all the revolutionary laws which were propoſed, or rather dictated, by them. One of their moſt horrible and deciſive conceptions was that of thoſe revolutionary tribunals which covered France with ſcaffolds, where thouſands of victims of every rank, age, and ſex, were daily ſacrificed; ſo that no claſs of men could be free from that ſtupifying and general terror which Robeſpierre found it neceſſary to ſpread, in order to eſtabliſh and make his power known. He ſoon himſelf dragged ſome members of his own party, ſuch as Danton, Camille des Moulins, and others, whoſe energy and popularity had offended him, before one of thoſe tribunals, where he had them condemned to death. By the ſame means he got rid of the chief leaders among the Briſſotines and Girondiſts; while he cauſed all the moderate republican party, who were ſtill members of the aſſembly, except thoſe who had time and addreſs to eſcape, to be ſent to priſon, in order to be ſentenced and executed on the firſt occaſion.

"In

563 T[he] fourth re[vol]ution pr[od]uces

"In this manner ended the third revolution, in which the people, frozen with terror, did not dare to take a part. Inſtead of an army of ſoldiers, Robeſpierre employed an army of executioners and aſſaſſins, ſet up as revolutionary judges; and the guillotine, ſtriking or menacing all heads indiſcriminately, made France, from one end to the other, ſubmit to him, by the means of terror or of death. Thus was this nation, formerly ſo proud, even to idolatry, of its kings, ſeen to expiate, by rivers of blood, the crime of having ſuffered his to be ſpilt who was the moſt virtuous of all their monarchs.

"In the room of that famous Baſtile, whoſe celebrated capture and demolition had ſet only ſeven priſoners at liberty, two of whom had long been in a ſtate of lunacy, the colleges, the ſeminaries, and all the religious houſes of the kingdom, were converted into ſo many ſtate priſons, into which were inceſſantly crowded, from time to time, the victims devoted to feed the ever-working guillotines, which were never ſuffered to ſtand ſtill for a day, becauſe they were at once the chief reſource of ſupplies for the government, and the inſtrument of its ferocity. 'The guillotine coins money for the republic,' was ſaid in the tribune by one of Robeſpierre's vileſt agents*. In fact, according to the juriſprudence of the revolutionary tribunals, the rich of every claſs, being declared ſuſpected perſons, received ſentence of death, for no other reaſon than that of giving the confiſcation of their property a ſhow of judicial form.

* [B]arrere.

"Still blood flowed too ſlowly to ſatisfy Robeſpierre; his aim was but partly attained by the proſcription of the nobles, the prieſts, and the wealthy. He fancied, not only an ariſtocracy of talents and knowledge, but of the virtues, none of which would his truſty orators and journaliſts admit, ſave that horrid *patriotiſm* which was eſtimated according to the enormity of the crimes committed in favour of the revolution. His plan was to reduce the French people to a mere plantation of ſlaves, too ignorant, too ſtupid, or too puſillanimous, to conceive the idea of breaking the chains with which he would have loaded them in the name of liberty; and he might have ſucceeded in it, had not his ambition, as impatient as it was jealous, too ſoon unveiled the intention of reſorting to the guillotine to ſtrike off the ſhackles with which an aſſembly of repreſentatives of the nation fettered, or might fetter, his power. He was about to give this deciſive blow, which he had concerted with the commune of Paris, the revolutionary tribunal, the club of Jacobins, and the principal officers of the national guard, when the members of the convention, who were marked out to be the firſt ſacrifices, anticipated him at a moment when he leaſt expected it, by attacking himſelf in the aſſembly, with energy ſufficient to rouſe all the ſections of the capital againſt him and againſt the Jacobins. The parties came to blows, and victory remained uncertain for ſeveral hours; but at length declared againſt Robeſpierre. In the ſpace of a day, that execrable monſter was dragged from the higheſt pitch of power ever attained by any tyrant, to the very ſcaffold that was ſtill reeking with the blood of his laſt victims. His principal accomplices in the committee of public ſafety, in the commune, in the national guard, in the revolutionary tribunal, and many of his agents in the provinces, met the ſame fate. The revolutionary tribunals were ſuppreſſed, and the priſons thrown open to all whom they had caſt into them.

564 the conſtitution of 1795.

"This fourth revolution, in which the faction then eſteemed the moderate party overthrew the terroriſts, and ſeized the ſupreme power, was no leſs complete than thoſe which had preceded it, and produced the conſtitution of 1795. All France received as a great bleſſing a conſtitution that delivered them from the revolutionary government and its infernal policy. Beſides it had, in ſpite of great defects, the merit of coming nearer than the two preceding ones, to the principles of order, of juſtice, and real liberty; the violation of which had, for five years before, been the ſource of ſo many diſaſters and ſo many crimes. The royaliſts, conſidering it as a ſtep towards monarchy, were unfortunately ſo imprudent as to triumph in it; and their joy, as premature as indiſcreet, alarmed the aſſembly to ſuch a degree, that they paſſed the famous law, ordaining the primary aſſemblies to return two-thirds of the members of the convention to the legiſlative body, which was to ſucceed that aſſembly. It was thus that the ſpirit of the convention continued, for the firſt year, to be diſplayed in the two councils.

"In the year following, the bias of the public mind, perhaps too haſtily turned towards royalty, ſhewed itſelf in the elections of the members for the new third, ſo clearly as to alarm the regicides who compoſed the directory, and the conventionaliſts, who ſtill made a third of the legiſlative body; nor did they loſe a moment in deviſing means for their defence. That which appeared the ſureſt to them was, to publiſh notices of plots among the royaliſts, and annex one or more denunciations, in terms ſo vague as to leave room for implicating, when neceſſary, all their adverſaries; while by the help of this impoſture they procured ſome ſecret information, artfully fabricated, and ever eaſily obtained through threats or rewards by thoſe who have at command the guillotine and the public treaſure.

"This maſked battery was ready to be opened before the members of the new third took their ſeats. Theſe at firſt confined themſelves to the ſecuring of a conſtant majority in the two councils in favour of the moderate opinions; but in a little time every ſitting was marked by the repeal of ſome revolutionary law, or by ſome decree tending to reſtrain the executive authority within the limits fixed by the conſtitution.

565 The fifth revolution.

"The directory, alarmed at the abridgement of their power, and dreading ſtill more ſerious attacks upon it, came to a reſolution of no longer poſtponing the blow they had been meditating againſt the legiſlative aſſembly: and they accompliſhed, in the manner already related, a fifth revolution, as complete as any of thoſe by which it was preceded. It differed indeed from them eſſentially in the facility and promptneſs with which it was effected, although the party which prevailed, that is to ſay, the majority of the directory, and the minority of the legiſlative body, had to combat not only againſt the conſtitution, but againſt the opinion, and even againſt the indignation of the public. That moral force, on which the majority of the two councils had unluckily placed all their reliance, vaniſhed in an inſtant before the phyſical force of a detachment of troops conſiſting of ſix or ſeven hundred men; ſo true is it that the power of the public opinion, ridiculouſly

France. diculouſly exaggerated in theſe days, is and can be no more, under a firm and well ordered government, than a mere fancy. Men accuſtom themſelves too eaſily to take for public opinion the private opinions made public by certain writers, whoſe caution or audaciouſneſs depends always upon the energy or feebleneſs of the ſupreme authority. It is the ſame thing with popular commotions: they are eaſily excited under a weak government, which does not poſſeſs the wiſdom to prevent or the ſpirit to ſuppreſs them; but a vigorous, juſt, and ſtrict government has nothing to fear from them. The directory, compelled to withdraw the larger body of troops, which they had thought neceſſary to enſure the revolution they were meditating, diſcovered, no doubt, great ability in ſecuring the two councils, by appearing to dread them: but it was chiefly to the energy of their meaſures, and to the concentration and promptneſs with which they were executed, that they owed their ſucceſs. Two days before, the legiſlative body might, without obſtruction, have impeached, arreſted, and even outlawed, the majority of the directory, who were execrated by the public under the title of triumvirate; and, if requiſite, they would have been ſupported by more than 30,000 armed citizens, who, with Pichegru and Villot at their head, would ſoon have diſperſed, and perhaps brought over, the feeble detachments of troops of the line which the directory had at their command. The legiſlative body, relying too much upon its popularity, did not ſufficiently conſider, that the people, whoſe impetuoſity is commonly deciſive when allowed to take advantage in attack, are always feeble on the defenſive, and totally unable to withſtand every aſſault made previous to an inſurrection, for it is always eaſy to prevent their aſſembling. It was on this principle that the directory founded their operations, and the 5th of September too well proves how juſtly. That day reduced the legiſlative body, by the moſt degrading ſubjugation, to a mere diſguſting caricature of national repreſentation; it inveſted the directory with the moſt arbitrary and tyrannic power, and reſtored the ſyſtem of Robeſpierre, under a form leſs bloody, but not leſs pernicious; for the revolutionary tribunals which that monſter had eſtabliſhed, were ſcarcely more expeditious than the military ones of the directory. The power of arbitrary and unlimited tranſportation is, in time, as deſtructive as the guillotine, without poſſeſſing, like that, the advantage of exciting a ſalutary horror, which, by recovering the people from the ſtate of ſtupor and apathy, the conſtant effects of terror, gives them both recollection and force to break their chains. Though, in violating the moſt eſſential regulations of the conſtitution, the directory obtained a temporary confirmation of their power, their example pointed out to Bonaparte and Sieyes the path which they purſued with infinite addreſs, and in which they accompliſhed a ſixth revolution."

566 The ſixth revolution, and conſular government.

The changes which ſucceeded, from the conſular to the imperial and deſpotic government of France, are freſh in the mind of every reader, ſo that the account of them need not be repeated.

567 Climate of France.

In a country ſo extenſive as that of France, it is not to be expected that the climate ſhould be invariably the ſame; but it is certainly clearer and more ſalubrious upon the whole than that of Britain; and it is admirably adapted to the cultivation of the vine, without which many parts of it would perhaps continue in a ſtate of nature. The country preſents to the eye a level appearance in general, but ſeveral mountains are met with in the ſouthern parts of it, ſuch, for example, as Auvergne, Languedoc, Dauphiné, and Provence. Some reckon the Limouſin the moſt beautiful province in France, although many parts of it beſides this exhibit a charming diverſity of hills and valleys, and ſome of the rivers, but the Seine in particular, often aſſume a pictureſque appearance. It cannot be ſaid that agriculture has attained to the perfection which it has done in Britain; yet in different provinces the cultivation of the ground ſeems to keep pace with its fertility, and the huſbandmen of others diſplay a degree of induſtry which is deſerving of commendation. As a ſtriking proof of this, many mountains of the Cevennes, only remarkable for their ſterility, have been rendered extremely fertile by the indefatigable exertions of induſtry. France.

568 Rivers.

The moſt remarkable rivers of France are commonly reckoned four in number, the Seine, Loire, Rhone, and the Garonne, although there are many others of inferior note. The Seine, is univerſally allowed to be a beautiful river, which takes its riſe in the department of Cote d'Or, and, after traverſing a country of about 250 miles in extent, falls into the Engliſh channel at Havre de Grace. The ſource of the Loire is in Mont Gerbier, in what was formerly called Languedoc, and after running about 500 miles, empties itſelf into the ſea beyond Nantes. The Rhone riſes from the Glacier of Furea, and the Garonne in the vale of Arau in the Pyrenees. The inferior rivers are the Saone, Dordogne, and a number of leſſer ſtreams which form a junction with the Loire.

569 Mountains.

There are numerous mountains in France, but there are none which are of a great height. It is perhaps diſputable whether we ſhould conſider Mont Blanc among the number, but if we do ſo, no other mountain in the vaſt chain of the Alps can exceed it in height. Thoſe of Brittany conſiſt chiefly if not wholly of granite, but there is nothing remarkable in their elevation. France is divided from Switzerland by Mont Jura; but the principal chain of mountains is that denominated Cevennes, running from north to ſouth, and ſending out ramifications from caſt to weſt. Some naturaliſts are of opinion, that certain volcanic appearances may be traced among the mountains in the departments of Cantal and the Upper Loire; but the baſaltic columns of which they chiefly conſiſt, either do not favour this conjecture, or leave the truth of it extremely problematical. The loftieſt mountains in France are thoſe called Monts d'Or, which conſtitute the centre, of which Puy de Sanſi forms the chief elevation, its height being computed at 6300 feet above the level of the ſea. This mountain is covered with perpetual ſnow, from the ſides of which iſſues the river Dordogne.

The Pyrenees have been known and celebrated in hiſtory ſince the time of Herodotus, and may with equal propriety be conſidered as belonging either to France or Spain; although they have been more ably and minutely deſcribed by the learned of the former country. Shells and ſkeletons of animals have been found among the Pyrenees, which may afford matter for ample diſcuſſion to the admirers of nature's productions. Marine productions

France. productions have been discovered on the top of Mont Perdu, which it is extremely difficult to ascend, because, in many places, it is almost perpendicular for nearly 600 feet; and near the summit there is a lake about 9000 feet above the level of the sea.

There are many forests in France, and of considerable extent, to the growth of which it becomes of importance to attend, as the chief fuel which the inhabitants can command is wood. The largest forests are those of Orleans and Ardennes, but our limits forbid us to give an enumeration of the rest, which could answer no important purpose.

570 Of the botanical state of this country nothing can be advanced with certainty; for although its productions of this nature may be said to have been examined around Paris, Lyons, and Montpelier, with considerable accuracy, yet much is still wanting to furnish any thing like a complete history of its vegetables. We have no certain accounts of what are purely indigenous or what are exotic, although the former must be more abundant in France than in any other European country.

571 The horses of this country are certainly inferior to those of Britain; and in former times its monarchs were drawn by oxen to the national assemblies. Their cattle are of a beautiful cream colour, but their sheep are much inferior to the English, owing perhaps to their wretchedly ill management, their meat being straw during the winter season instead of green food. France in some places is infested by the wild boar and the wolf, while the ibex and chamois inhabit the Pyrenees and the Alps. France.

572 At one period there were gold mines in the southern parts of France, and particles of that precious metal are still to be found in some of the rivulets. There are mines of silver in Alsace, and mines of copper in the departments of the Alps. The duchy of Deux Ponts contains mines of mercury; antimony is found in Ardeche; and abundance of iron, the most extensively useful of all the metals, is met with in the northern departments, for the working of which there were computed to be 2000 furnaces employed in the year 1798. Minerals.

573 The population of France has been variously estimated by different writers; but we hope our readers will find a pretty accurate account of it by inspecting the following table, which exhibits the number contained in each department, according to the republican division of it since the revolution. Population.

Ancient Provinces.	*Departments.*	*Population.*	*Chief Towns.*
Flandre Françoise.	Nord.	578,435	Douai.
Artois.	Pas-de-Calais.	532,741	Arras.
Picardie.	Somme.	466,998	Amiens.
Normandie.	Seine Inferieure.	640,890	Rouen.
	Calvados.	484,212	Caen.
	Manche.	317,120	Coutances.
	Orne.	407,475	Alençon.
	Eure.	257,986	Evreux.
Isle de France.	Seine.	738,522	Paris.
	Seine and Oise.	437,604	Versailles.
	Oise.	355,634	Beauvais.
	Aisne.	408,174	Laon.
	Seine and Marne.	291,159	Melun.
Champagne.	Marne.	291,484	Chalons-sur Marne.
	Ardennes.	253,902	Mezieres.
	Aube.	228,814	Troyes.
	Haute Marne.	222,585	Chammont.
Lorraine.	Meuse.	257,237	Bar-sur-Ornain.
	Moselle.	379,001	Metz.
	Meurthe.	336,895	Nancy.
	Vosges.	115,546	Epinal.
Alsace.	Haut-Rhin.	330,408	Colmar.
	Bas-Rhin.	448,483	Strasbourg.
Bretagne.	Isle and Vilaine.	511,840	Rennes.
	Cotes du Nord.	530,441	St Brieux.
	Finisterre.	220,108	Quimper.
	Morbihan.	415,194	Vannes.
	Loire Inferieure.	451,336	Nantes.
Maine and Perche.	Sarthe.	381,241	Le Mans.
	Mayenne.	324,730	Laval.
Anjou.	Mayenne and Loire.	442,482	Angers.
Touraine.	Indre and Loire.	264,935	Tours.
Orleannois.	Loiret.	290,031	Orleans
	Eure and Loire.	210,179	Chartres.
	Loire and Cher.	307,084	Blois.
Berri.	Indre.	216,882	Chateauroux.
	Cher.	219,459	Bourges.

Nivernois.

France.

Ancient Provinces.	Departments.	Population.	Chief Towns.
Nivernois. . . .	Nievre.	238,812	Nevers.
Bourgogne. . . .	Yonne.	127,510	Auxerre.
	Cote d'Or.	339,860	Dijon.
	Saone and Loire.	440,773	Maçon.
	Ain.	288,700	Bourg.
Franche-Compté. . .	Haute-Saone.	284,073	Veſoul.
	Doubs.	216,878	Beſançon.
	Jura.	284,460	Lons-le-Saunier.
Poitou.	Vendée.	291,433	Fontenay-le-Peuple.
	Deux-Sevres.	256,057	Niort.
	Vienne.	318,511	Poitiers.
Marche.	Haut-Vienne, compriſing part of Limoſin.	129,006	Limoge.
	Creuze.	225,373	Guèret.
Limoſin.	Correze, compriſing part of Upper Vienne.	254,502	Tulle.
Bourbonnois. . . .	Allier.	266,105	Moulins.
Saintonge and Aunis. .	Charente-Inferieure.	420,896	Saintes.
Angoumois and part of Saintonge.	Charente.	319,427	Angouleme.
Auvergne. . . .	Puy-de-dôme.	505,332	Clermont.
	Cantal.	243,708	St Flour.
Lyonnois, Foret and Beaujolois.	Rhone.	305,454	Lyons.
	Loire.	322,965	Montbriſon.
	Iſere.	430,106	Grenoble.
Dauphiné. . . .	Hautes-Alpes.	116,754	Gap.
	Drome.	232,619	Valence.
Guyenne, comprehending Gaſcogne. . . .	Dordogne.	441,380	Perigueux.
	Gironde.	557,585	Bourdeaux.
	Lot and Garonne.	404,936	Agen.
	Lot.	387,019	Cahors.
	Aveyron.	332,090	Rhodez.
	Gers.	288,555	Auch.
	Landes.	311,267	Mont-de-Marſan.
	Hautes-Pyrenees.	180,093	Tarbe.
Bearn.	Baſſes-Pyrenees.	368,731	Pau.
Comté-de-Foix. . . .	Arriege.	194,838	Taraſcon.
Rouſſillon. . . .	Pyrenees-Orientales.	106,171	Perpignan.
Languedoc. . . .	Haute-Garonne.	310,672	Toulouſe.
	Aude.	219,101	Carcaſſonne.
	Tarn.	271,402	Caſtres.
	Garde.	309,802	Niſmes.
	Lozere.	132,502	Mende.
	Ardeche.	273,255	Privas.
	Haute-Loire.	259,143	Le Puy.
	Heraut.	273,452	Montpellier.
Provence. . . .	Bouches-du Rhone.	323,177	Aix.
	Baſſes-Alpes.	144,436	Digne.
	Var.	262,926	Toulon.
Corſica.	Golo.	157,874	Baſtia.
	Liamone.	210,710	Ajaccio.

574 Religion, &c.

The eſtabliſhed religion is that of the church of Rome, but entirely independent of the Holy ſee; and the revenues of the clergy are not ſo extenſive as to render them formidable to the preſervation of the ſtate. Of its political conſtitution, as that is an ignis fatuus which eludes all deſcription, little need be ſaid. The government at preſent is a military deſpotiſm, and Bonaparte, once firſt conſul, now emperor, owes his very exiſtence, either as a man or a monarch, to the attachment of the ſoldiery. Let him loſe that, and he is inevitably undone.

575 Army.

Since the revolution, it is perhaps impoſſible to give a juſt account of the ſtrength of the French army, for both themſelves and their enemies made it, we believe, more numerous than it really was, although both parties muſt have been actuated by very different motives. The numerous defeats which the allies experienced, rendered it neceſſary to ſpeak of their antagoniſts as a never-


FRANCE.
French Leagues.
English Miles.
ENGLAND
ENGLISH CHANNEL
STRAIT OF DOVER
BAY OF BISCAY
GULF of LYON
GERMANY
SWITZERLAND
SPAIN
CORSICA
Paris
Lyon
Bordeaux
Marseille
Toulouse
Orleans
Rouen
Nantes
Strasbourg
Brussels
Geneva
Genoa
Milan
Turin
Florence

ance. never-to-be-diminiſhed ſwarm of men, and the French no doubt gave exaggerated reports of their own actual ſtrength, in order to intimidate the allies. In the time of the old government, the army amounted to 170,000 infantry, 44,000 cavalry, and 11,000 artillery; and perhaps at no period of the revolution did it ever exceed 600,000 men, although it has been often magnified to the prodigious total of a million.

576 Navy. The naval force of France was once formidable even to Britain: but the decided ſuperiority in this reſpect has been invariably poſſeſſed by the latter country ever ſince the battle of La Hogue. The combined naval ſtrength of France and Spain could not reſiſt the impetuoſity of a Britiſh fleet off Trafalgar, under the command of the ever memorable Lord Nelſon.

577 Revenue. The revenue of France, during the exiſtence of the old government, has been eſtimated at thirty millions ſterling, but the clear produce could not exceed eighteen millions, after the deduction of all expences. Under the preſent uſurpation, however, it is impoſſible to make any eſtimate of its amount, as it is often augmented in an unknown and fluctuating ratio by plunder and rapine.

578 Learning. With reſpect to literature, France certainly holds a diſtinguiſhed place among the nations of Europe; and if the palm has been adjudged to Italy and Britain by ſome authors, in point of bold invention and profound philoſophical ſpeculations, French authors are to be met with in great abundance who have done honour to human nature by their polite learning, and elegant as well as uſeful ſcience. Altogether independent of a Corneille, a Racine, a Crebillon, a Moliere, or a Voltaire, this country has, at a more modern period, produced many diſtinguiſhed writers in literature and philoſophy, whoſe productions will continue to be read and admired, ſo long as men retain a ſenſe of the value and importance of the ſciences they reſpectively luſtrate.

At one period there were no fewer than 21 univerſities in France, of which the Sorbonne at Paris was reputed the moſt celebrated, the fame of which drew numbers of ſtudents from diſtant countries. There were about 39 academies and literary ſocieties, which produced many elegant and valuable diſſertations on the different ſciences, which have been long known to, and juſtly eſteemed by, the learned world.

579 Cities, &c. The cities of France are very numerous, and many of them make a moſt conſpicuous figure. Paris, which is ſtill the metropolis, has been ſometimes reckoned a third ſmaller than London, and its population ſtated at 600,000 ſouls. It has often been conſidered as ſuperior to London in point of magnificence, but it is undoubtedly inferior, both in regard to convenience and cleanlineſs, the ſtreets in general having very poor accommodations for paſſengers on foot;—a defect for which no elegance or magnificence can fully compenſate. The next to Paris in importance, is the city of Lyons, the population of which is computed at 100,000; but the deſolation which it ſuffered during the tremendous reign of Jacobin fury it will perhaps never recover, as the abolition of monarchy was the innocent cauſe of the ruin of its trade, which conſiſted chiefly in the manufacture of ſuch ſplendid articles as were conſumed by the court.

Next to Lyons we may mention Marſeilles and Bourdeaux, each of which are computed to contain about 80,000 people; and the port of the former city is perhaps the beſt, as well as the moſt frequented, of any in the Mediterranean. Liſle and Valenciennes are both ſtrongly fortified cities, the former of which has a population of about 60,000. It ſurrendered to the combined powers in the year 1793, but the French retook it in the following year. The remaining cities, of which we can only give a bare enumeration, are Amiens, Rouen, Breſt, Nantes, Orleans, Nancy, Metz, Straſbourg, Toulouſe, Montpelier, &c. none of them having a population under 30,000 ſouls, many of them carrying on an extenſive trade, and all of them abounding with elegant buildings. France.

There are ſeveral public edifices in France, which command the admiration of every beholder, ſuch as the palace of Verſailles, the beautiful and magnificent bridge of Neuillé, and the ancient cathedrals and caſtles, of which there are prodigious numbers. The bridge of Neuillé indeed has been reckoned ſuperior to any in Europe.

580 Canals. Many exertions have been made at different periods, to improve the inland navigation of France. The great Henry IV. began the celebrated canal of Burgundy, which was finiſhed by Louis XIII. and by which a communication is opened between the rivers Loire and Seine. It conſiſts of 42 locks, and is of ſingular importance to the commerce of the weſtern provinces. The canal of Picardy reaches from the river Somme to the Oiſe, taking its riſe from St Quintin, and affording an intercourſe to the provinces lying on the north-eaſt. But the greateſt and moſt expenſive work of this nature in France, which was begun and finiſhed by Louis XIV. is the canal of Languedoc, which was completed in 15 years. It is 144 feet broad, ſix feet deep, and about 180 miles long, and it coſt upwards of half a million ſterling.

581 Trade. The total amount of the exports of France in the year 1784, excluſive of the provinces of Lorraine and Alſace, and the trade with the Weſt Indies which has been ſince carried on, was 307,151,700 livres, and her imports 271,365,000, leaving a balance of 35,786,700 livres, which amount to 1,565,668l. ſterling. Britiſh commerce has been on the increaſe ever ſince the commencement of the revolution, while it may be juſtly ſaid that the trade of France has been proportionally on the decline, although we cannot aſſert with a certain geographer, that it has been "almoſt annihilated."

Iſle of FRANCE, a late province of France, but now divided into five departments, and ſo called, becauſe it was formerly bounded by the rivers Seine, Marne, Oiſe, Aiſne, and Ourque. It comprehends beſides Paris, the Beauvoiſis, the Valois, the county of Senlis, the Vexin, the Hurepois, the Gatinois, the Multien, the Goele, and the Mantois. Paris is the capital.

FRANCFORT *on the* MAINE, an imperial and hanſeatic town of Franconia in Germany, where the emperors were formerly elected. It is a handſome, ſtrong, and rich place, and has a great deal of commerce. Here the golden bull is preſerved, which is the original of the fundamental laws of the empire. It is ſeated in a fine fertile plain; and well fortified with a double ditch, baſtions, redoubts, and ravelins. The ſtreets are remarkably wide, and the houſes handſomely built.

Francfort || Franchiſe.

It has a great conveniency for carrying on an extenſive trade with the other parts of Germany, by means of the navigable river which runs through it. It was taken in October 1792, by the French, who were diſpoſſeſſed of it by the Pruſſians in December following; it was again taken by the French in July 1796, but they evacuated it to the Auſtrians in September following. The ſuburb is called *Saxon-hauſen*, and joined to the town by a ſtone bridge built over the Maine. E. Long. 8. 37. N. Lat. 50. 7.

FRANCFORT on the Oder, a rich and handſome town of Germany, in the middle marche of Brandenburgh, formerly imperial, but now ſubject to the king of Pruſſia. It is remarkable for three great fairs, and a celebrated univerſity; and was taken by the French in 1806. It lies about 45 miles ſouth eaſt of Berlin, and 72 ſouth of Stetin. E. Long. 14. 45. N. Lat. 52. 22.

FRANCHE-COMPTE, a late province of France, bounded on the ſouth and weſt by Champagne and Burgundy; on the north by Lorrain; and to the eaſt by the earldom of Mumplegard, and Switzerland. It is in length from north to ſouth about 30 leagues; in breadth about 20. It is partly flat and partly hilly. The flat country is fruitful in grain, wine, hemp, and paſture; and the hilly country abounds in cattle, producing alſo ſome wine and corn, copper, lead, iron, and ſilver ores, mineral waters, and quarries of ſtone, marble, and alabaſter. It now forms the three departments of Doubs, Jura, and Upper Saone.

FRANCHISE, in *Law*. *Franchiſe* and *liberty* are uſed as ſynonymous terms; and their definition is, "a royal privilege, or branch of the king's prerogative, ſubſiſting in the hands of a ſubject." Being therefore derived from the crown, they muſt ariſe from the king's grant; or in ſome caſes may be held by preſcription, which, as has been frequently ſaid, preſuppoſes a grant. The kinds of them are various, and almoſt infinite. We ſhall here briefly touch upon ſome of the principal, premiſing only, that they may be veſted in either natural perſons or bodies politic; in one man, or in many: but the ſame identical franchiſe, that has before been granted to one, cannot be beſtowed on another, for that would prejudice the former grant.

To be a county palatine, is a franchiſe veſted in a number of perſons. It is likewiſe a franchiſe for a number of perſons to be incorporated and ſubſiſt as a body politic; with a power to maintain perpetual ſucceſſion, and do other corporate acts: and each individual member of ſuch corporation is alſo ſaid to have a franchiſe or freedom. Other franchiſes are, to hold a court leet; to have a manor or lordſhip; or, at leaſt, to have a lordſhip paramount: to have waifs, wrecks, eſtrays, treaſure-trove, royal fiſh, forfeitures, and deodands: to have a court of one's own, or liberty of holding pleas and trying cauſes: to have the cognizance of pleas; which is ſtill a greater liberty, being an excluſive right, ſo that no other court ſhall try cauſes ariſing within that juriſdiction: to have a bailiwick, or liberty exempt from the ſheriff of the county; wherein the grantee only, and his officers, are to execute all proceſs: to have a fair or market; with the right of taking toll, either there or at any other public places, as at bridges, wharfs, or the like; which tolls muſt have a reaſonable cauſe of commencement (as in conſideration of repairs, or the like), elſe the franchiſe is illegal and void: or laſtly, to have a foreſt, chaſe, park, warren, or fiſhery, endowed with privileges of royalty. See CHASE, FOREST, &c.

Franchiſe || Franciſcans

FRANCHISE is alſo uſed for an aſylum or ſanctuary, where people are ſecure of their perſons, &c. Churches and monaſteries in Spain are franchiſes for criminals; ſo were they anciently in England, till they were abuſed to ſuch a degree that there was a neceſſity for aboliſhing the cuſtom. One of the moſt remarkable capitulars made by Charlemagne in his palace of Heriſtal, in 779, was that relating to the franchiſes of churches. The right of franchiſe was held ſo ſacred, that even the leſs religious kings obſerved it to a degree of ſcrupulouſneſs: but to ſuch exceſs in time was it carried, that Charlemagne reſolved to reduce it. Accordingly he forbade any proviſion being carried to criminals retired into churches for refuge.

FRANCHISE of Quarters, is a certain ſpace or diſtrict at Rome, wherein are the houſes of the ambaſſadors of the princes of Europe; and where ſuch as retire cannot be arreſted or ſeized by the ſbirri or ſerjeants, nor proſecuted at law. The people of Rome look on this as an old uſurpation and a ſcandalous privilege, which ambaſſadors, out of a jealouſy of their power, carried to a great length in the 15th century, by enlarging inſenſibly the dependencies of their palaces or houſes, within which the right of franchiſe was anciently confined. Several of the popes, Julius III. Pius XIV. Gregory XIII. and Sixtus V. publiſhed bulls and ordinances againſt this abuſe; which had reſcued ſo conſiderable a part of the city from their authority, and rendered it a retreat for the moſt abandoned perſons. At length Innocent XI. expreſsly refuſed to receive any more ambaſſadors but ſuch as would make a formal renunciation of the franchiſe of quarters.

FRANCIS I. king of France, the rival of the emperor Charles V. and the reſtorer of learning and politeneſs in France. See (*Hiſtory of*) FRANCE.

FRANCIS, *Philip*, a very ingenious writer, of Iriſh extraction, if not born in that kingdom. His father was a dignified clergyman in Ireland, being dean of ſome cathedral; and our author, his ſon, was alſo bred to the church, and had a doctor's degree conferred on him. He was more diſtinguiſhed as a tranſlator than as an original writer. His verſions of Horace and Demoſthenes have been juſtly valued: the former is accompanied with notes, and is perhaps as complete and uſeful a work of its kind as hath yet appeared. He was alſo a conſiderable political writer; and in the beginning of the preſent reign is ſuppoſed to have been employed by the government: for which ſervice he was promoted to the rectory of Barrow in Suffolk, and to the chaplainſhip of Chelſea hoſpital. He was alſo the author of two tragedies, Eugenia and Conſtantia; but as a dramatic writer, not very ſucceſsful. He died at Bath in March 1773; leaving a ſon, who was then one of the ſupreme council at Bengal.

FRANCISCANS, in *Eccleſiaſtical Hiſtory*, are religious of the order of St Francis, founded by him in the year 1209. Francis was the ſon of a merchant of Aſſiſi, in the province of Umbria, who, having led a diſſolute life, was reclaimed by a fit of ſickneſs, and afterwards fell into an extravagant kind of devotion, that

Franciſcans. that looked leſs like religion than alienation of mind. Soon after this, viz. in the year 1208, hearing the paſſage repeated, Mat. x. 9. 10. in which Chriſt addreſſes his apoſtles, *Provide neither gold, nor ſilver*, &c. he was led to conſider a voluntary and abſolute poverty as the eſſence of the goſpel, and to preſcribe this poverty as a ſacred rule both to himſelf and to the few that followed him. This new ſociety, which appeared to Innocent III. extremely adapted to the preſent ſtate of the church, and proper to reſtore its declining credit, was ſolemnly approved and confirmed by Honorius III. in 1223, and had made conſiderable progreſs before the death of its founder in 1226. Francis, through an exceſſive humility, would not ſuffer the monks of his order to be called *fratres*, i. e. brethren or friars, but *fraterculi*, i. e. little brethren, or friars-minor, by which denomination they ſtill continue to be diſtinguiſhed. They are alſo called *gray friars*, on account of the colour of their clothing, and *cordeliers*, &c. The Franciſcans and Dominicans were zealous and active friends to the papal hierarchy, and, in return, were diſtinguiſhed by peculiar privileges and honourable employments. The Franciſcans, in particular, were inveſted with the treaſure of ample and extenſive indulgences; the diſtribution of which was committed to them by the popes, as a means of ſubſiſtence, and a rich indemnification for their voluntary poverty. In conſequence of this grant, the rule of the founder, which abſolutely prohibited both perſonal and collective property, ſo that neither the individual nor the community were to poſſeſs either fund, revenue, or any worldly goods, was conſidered as too ſtrict and ſevere, and diſpenſed with ſoon after his death. In 1231, Gregory IX. publiſhed an interpretation of this rule, mitigating its rigour; which was farther confirmed by Innocent IV. in 1245, and by Alexander IV. in 1247. Theſe milder operations were zealouſly oppoſed by a branch of the Franciſcans called the *ſpiritual*; and their complaints were regarded by Nicholas III. who, in 1279, publiſhed a famous conſtitution, confirming the rule of St Francis, and containing an elaborate explication of the maxims it recommended, and the duties it preſcribed. In 1287, Matthew of Aqua Sparta, being elected general of the order, diſcouraged the ancient diſcipline of the Franciſcans, and indulged his monks in abandoning even the appearance of poverty; and this conduct inflamed the indignation of the ſpiritual or auſterer Franciſcans; ſo that from the year 1290 ſeditions and ſchiſms aroſe in an order that had been ſo famous for its pretended diſintereſtedneſs and humility. Such was the enthuſiaſtic frenzy of the Franciſcans, that they impiouſly maintained, that the founder of their order was a ſecond Chriſt, in all reſpects ſimilar to the firſt; and that their inſtitution and diſcipline were the true goſpel of Jeſus. Accordingly, Albizi, a Franciſcan of Piſa, publiſhed a book in 1383, with the applauſe of his order, entitled, The book of the Conformities of St Francis with Jeſus Chriſt. In the beginning of this century, the whole Franciſcan order was divided into two parties; the one embracing the ſevere diſcipline and abſolute poverty of St Francis, were called *ſpirituals*; and the other, who inſiſted on mitigating the auſtere injunctions of their founder, were denominated *brethren of the community*. Theſe wore long, looſe, and good habits, with large hoods; the former were clad in a ſtraight, coarſe, and ſhort dreſs, pretending that this dreſs was enjoined by St Francis, and that no power on earth had a right to alter it. Neither the moderation of Clement V. nor the violence of John XXII. could appeaſe the tumult occaſioned by theſe two parties; however, their rage ſubſided from the year 1329. In 1368 theſe two parties were formed into two large bodies, comprehending the whole Franciſcan order, which ſubſiſt to this day; viz. the *conventual brethren*, and the *brethren of the obſervance* or *obſervation*, from whom ſprung the capuchins and recollects. The general opinion is, that the Franciſcans came into England in the year 1224, and had their firſt houſe at Canterbury, and their ſecond at London; but there is no certain account of their being here till King Henry VII. built two or three houſes for them. At the diſſolution of the monaſteries, the conventual Franciſcans had about 55 houſes, which were under ſeven cuſtodies or wardenſhips; viz. thoſe of London, York, Cambridge, Briſtol, Oxford, Newcaſtle, and Worceſter. Franciſcans, Francois.

FRANCOIS, or FRANCAIS, *Port Des*, the name of a bay or harbour diſcovered by Peyrouſe on the north-weſt coaſt of America, is ſituated in N. Lat. 58. 37. and in Long. 139. 50. W. from Paris. This harbour was from three to four leagues deep: he entered it with his two frigates in July 1786, and came to an anchor in an iſland near the middle of it, in 20 fathoms water, with a muddy bottom. The bottom of the bay, he obſerves, is one of the moſt extraordinary places in the world; the water is ſo deep that it could not be fathomed, and ſurrounded by peaked mountains of a great height, covered with ſnow, without vegetation, and ſeemingly condemned by nature to perpetual ſterility. He never ſaw the ſurface of the water ruffled with the ſmalleſt breath of air, or in the leaſt diſturbed but by the falling of enormous pieces of ice, which continually detach themſelves from five different glaciers. The air was ſo calm, and the ſilence ſo profound, that the voice of man might be heard at the diſtance of half a league, as well as the noiſe of ſea-birds which hatch their eggs in the cavities of the rocks.

He found the variation of the compaſs to be 28° E. and the dip of the needle 74°. At full and change of the moon, when it is high water at one o'clock, the ſea roſe ſeven feet and a half. The current of the channel at the entrance of the harbour, during the ſea breeze, came in like a rapid river, ſo that it muſt be impracticable to take the channel when the winds blow violently from the ſouthward; and indeed the currents at all times render the entrance difficult. This harbour poſſeſſes many advantages, but it is alſo ſubject to ſeveral inconveniences. It ſeems not to be convenient for ſhips to anchor, which are employed in trafficking in ſkins, becauſe ſuch ſhips ought to enter many bays, making in each a ſhort ſtay, ſince the whole ſtock of the Indians is very ſoon diſpoſed of; but it ſeems to be a very commodious place for the eſtabliſhment of a factory, and this commercial ſettlement, it is ſuggeſted, ſhould be made on Cenotaph iſland, a name given to an iſland in the middle of the harbour, from the monument erected on it to the memory of ſome of the crew of Peyrouſe's ſhips, which were loſt in the channel. This iſland is about a league in circumference, abounds with wood and water, and ſeems capable of cultivation. The quar-

Francois ii Frank.

tity of otter ſkins far exceeded any thing which Peyrouſe had obſerved in any other part of America.

The climate of this coaſt, according to Peyrouſe, ſeemed much milder than that of Hudſon's Bay. For three or four months of the year vegetation was very vigorous; there was found abundance of celery, endive, lupin, and yarrow, with moſt of the plants which are common in the meadows and mountains of France. Gooſeberries, raſpberries, and ſtrawberries, were alſo common in the woods; poplars, willows, hornbeam, and pines, ſome of which meaſured ſix feet in diameter, and 140 feet high, fit for maſts of the largeſt ſhips. The river ſeemed to be filled with trout and ſalmon, and different kinds of fiſh were found in the bay itſelf. The variety of birds was not great; but bears, martens, and ſquirrels, were frequent in the woods. The inhabitants are ſaid to be conſiderably different from the Californians, being taller, ſtouter, of a more agreeable figure, having greater vivacity of expreſſion, and a greater ſhare of courage and ſenſe. Their colour is olive, and the hair in general is neither ſo coarſe nor black as that of the South Americans. It is ſuppoſed that they are worſhippers of the ſun, for they were frequently obſerved addreſſing themſelves in their prayers to this planet; but neither temple nor prieſt, nor trace of public worſhip, was ſeen. It is ſaid that they burn their dead.

FRANCONIA, a circle of Germany, bounded on the north by the circle of Upper Saxony, on the eaſt by that of Bavaria, on the ſouth by that of Swabia, and on the weſt by the circles of the Rhine. The middle is fertile in corn, wine, and fruits, but the borders are full of woods and barren mountains.

This country was overrun by the French republicans in the ſummer of 1796; but in September the Auſtrians compelled them to retreat. The Franks, who conquered France, came from this province, and gave their name to this kingdom.

FRANGULA. See RHAMNUS, BOTANY *Index*.

FRANK LANGUAGE, *Lingua Franca*, a kind of jargon ſpoken on the Mediterranean, and particularly throughout the coaſts of and ports of the Levant, compoſed of Italian, Spaniſh, French, vulgar Greek, and other languages.

FRANK, or *Franc*, an ancient coin, either of gold or ſilver, ſtruck and current in France. The value of the gold franc was ſomething more than that of the gold crown: this coin has been long out of uſe, though the term is ſtill retained as the name of a money of account: in which ſenſe it is equivalent to the livre, or 20 ſols.

FRANK, or *Franc*, meaning literally *free* from charges and impoſitions, or exempt from public taxes, has various ſignifications in the ancient Engliſh cuſtoms.

FRANK-Almoigne, (*libera eleemoſyna*), or "free alms;" a tenure of a ſpiritual nature, whereby a religious corporation, aggregate or ſole, holdeth lands of the donor to them and their ſucceſſors for ever. The ſervice which they were bound to render for theſe lands was not certainly defined: but only in general to pray for the ſouls of the donor and his heirs, dead or alive; and therefore they did no fealty (which is incident to all other ſervices but this), becauſe this divine ſervice was of a higher and more exalted nature. This is the tenure by which almoſt all the ancient monaſteries and religious houſes held their lands; and by which the parochial clergy, and very many eccleſiaſtical and eleemoſynary foundations, hold them at this day; the nature of the ſervice being upon the Reformation altered, and made conformable to the purer doctrines of the church of England. It was an old Saxon tenure; and continued under the Norman revolution, through the great reſpect that was ſhown to religion and religious men in ancient times. This is alſo the reaſon that tenants in frank almoigne were diſcharged of all other ſervices except the *trinoda neceſſitas*, of repairing the highways, building caſtles, and repelling invaſions; juſt as the Druids, among the ancient Britons had *omnium rerum immunitatem*. And even at preſent, this is a tenure of a very different nature from all others; being not in the leaſt feodal, but merely ſpiritual. For, if the ſervice be neglected, the law gives no remedy by diſtreſs, or otherwiſe, to the lord of whom the lands are holden; but merely a complaint to the ordinary or viſitor to correct it. Frank.

FRANK-Chaſe is defined to be a liberty of free chaſe, whereby perſons that have lands within the compaſs of the ſame, are prohibited to cut down any wood, &c. out of the view of the foreſter.

FRANK-Fee, ſignifies the ſame thing as holding lands and tenements in fee-ſimple; that is to any perſon and his heirs, and not by ſuch ſervice as is required by ancient demeſne, but is pleaded at common law. See FEE.

FRANK-Law, a word applied to the free and common law of the land, or the benefit a perſon has by it.

He that for any offence loſeth this frank-law incurs theſe inconveniences, viz. He may not be permitted to ſerve on juries, nor uſed as an evidence to the truth; and if he has any thing to do in the king's court, he muſt not approach it in perſon, but appoint his attorney; his lands, goods, and chattels, ſhall be ſeized into the king's hands; and his lands be eſtreated, his trees rooted up, and his body committed to cuſtody.

FRANK-Marriage, in *Law*, is where tenements are given by one man to another, together with a wife, who is the daughter or couſin to the donor, to hold in frank-marriage. By ſuch gift, though nothing but the word *frank-marriage* is expreſſed, the donees ſhall have the tenements to them, and the heirs of their two bodies begotten; that is, they are tenants in ſpecial tail. For this one word, *frank-marriage*, denotes, *ex vi termini*, not only an inheritance, like the word *frank-almoigne*, but likewiſe limits that inheritance; ſupplying, not only words of deſcent, but of procreation alſo. Such donees in frank-marriage are liable to no ſervice but fealty: for a rent reſerved therein is void until the fourth degree of conſanguinity be paſt between the iſſues of the donor and donee.

FRANK-Pledge, in *Law*, ſignifies a pledge or ſurety for the behaviour of freemen.

According to the ancient cuſtom of England, for the preſervation of the public peace, every freeborn man, at the age of fourteen, except religious perſons, clerks, knights, and their eldeſt ſons, was obliged to give ſecurity for his truth and behaviour towards the king and his ſubjects, or elſe be impriſoned. Accordingly, a certain number of neighbours became interchangeably bound

Frank || Frankfort.

bound for each other, to ſee each perſon of their pledge forthcoming at all times, or to anſwer for the offence of any one gone away: ſo that whenever any perſon offended, it was preſently inquired in what pledge he was, and there the perſons bound either produced the offender in 31 days, or made ſatisfaction for his offence.

FRANK-Tenement. See TENURE.

FRANKED LETTERS. The privilege of letters coming free of poſtage to and from members of parliament was claimed by the houſe of commons in 1660, when the firſt legal ſettlement of the preſent poſt office was made; but afterwards dropped, upon a private aſſurance from the crown, that this privilege ſhould be allowed the members. And accordingly a warrant was conſtantly iſſued to the poſtmaſter general, directing the allowance thereof to the extent of two ounces in weight: till at length it was expreſsly confirmed by 4 Geo. III. c. 24. which adds many new regulations, rendered neceſſary by the great abuſes which had crept into the practice of franking; whereby the annual amount of franked letters had increaſed from 23,600l. in the year 1715, to 170,700l. in the year 1763. Further regulations have ſince taken place; in particular, franks muſt be dated (the month written at length), and put into the office the ſame day; notwithſtanding which, the revenue ſtill loſes by this privilege a very conſiderable annual ſum.

FRANKEN, FRANCISCUS, commonly called *Old Frank*, a famous Flemiſh painter, ſuppoſed to have been born about the year 1544; but though his works are well known, very few of the circumſtances of his life have been tranſmitted to poſterity. This maſter painted hiſtorical ſubjects from the Old and New Teſtaments; and was remarkable for introducing a great number of figures into his compoſitions, which he had the addreſs to group very diſtinctly. Vandyck often commended his works, and thought them worthy of a place in any collection.

FRANKEN, *Franciſcus*, diſtinguiſhed by the name of *Young Frank*, was the ſon of the former, born in the year 1580. He was inſtructed by his father; whoſe ſtyle he adopted ſo cloſely, that their works are frequently miſtaken. When he found himſelf ſufficiently ſkilled at home, he travelled into Italy for improvement in colouring; and, on his return, his works were much coveted. The moſt capital performances of this painter are, a ſcriptural performance in the church of Notre Dame at Antwerp; and an excellent picture, in a ſmall ſize, of Solomon's idolatry. Young Frank died in 1642.

FRANKENDAL, a ſtrong town of Germany, in the dominions of the Elector Palatine, ſituated near the Rhine, about ſeven miles ſouth of Worms. It was taken by the Spaniards in 1623, by the Swedes in 1632, burnt by the French in 1688, and finally taken by the allies in the year 1794. E. Long. 8. 29. N. Lat. 49. 25.

FRANKENIA, a genus of plants belonging to the hexandria claſs; and in the natural method ranking under the 17th order, *Calycanthemæ*. See BOTANY *Index*.

FRANKFORT, the name of ſeveral townſhips in different places of North America; ſuch as Frankfort, a townſhip in Hancock, and diſtrict of Maine, with a few houſes regularly built. It contains 891 inhabitants, and lies about 238 miles north-eaſt of Boſton. Frankfort, a thriving village in Philadelphia; the name of another in Hampſhire, of one in Virginia, and the name of the metropolis of Kentucky.

Frankfort || Franklin.

FRANKINCENSE. See INCENSE.

FRANKLIN, THOMAS, D. D. chaplain in ordinary to his majeſty, was born in London about the year 1720, and was the ſon of Richard Franklin, well known as the printer of an anti-miniſterial paper called *The Craftſman*; in conducting which he received great aſſiſtance from Lord Bolingbroke, Mr Pulteney, and other excellent writers, who then oppoſed Sir Robert Walpole's meaſures. By the advice of the ſecond of theſe gentlemen, young Franklin was devoted to the church, with a promiſe of being provided for by the patriot; who afterwards forgot his undertaking, and then entirely neglected him. He was educated at Weſtminſter ſchool; from whence he went to the univerſity of Cambridge, where he became fellow of Trinity college, and was ſome time Greek profeſſor. In December 1758, he was inſtituted vicar of Ware and Thundridge; which, with the lecture-ſhip of St Paul, Covent Garden, and a chapel in Queen ſtreet, were all the preferments he held till he obtained the rectory of Braſted in Kent. This gentleman was poſſeſſed of no inconſiderable ſhare of learning and poetical abilities, and was long a favourite in the literary world. His tranſlations of Phalareus, Sophocles, and Lucian, equally evince his learning and his genius, as they are not more diſtinguiſhed for fidelity in the verſion, than congeniality with the ſpirit of the admirable originals. Dr Franklin, like Mr Foote, ſuffered a tranſlation from the French to be printed in his name; but the Oreſtes and Electra are ſuppoſed to be all that were really by him. It was a tranſlation of Voltaire's works, to which alſo Dr Smollett's name appears. His own dramatic compoſitions, of which the principal are the tragedies of The Earl of Warwick and Matilda, are univerſally known, and deſervedly eſteemed by the public. He died in March 1784.

FRANKLIN, *Benjamin*, a philoſopher and a ſtateſman of conſiderable eminence, was born in the year 1706, at Boſton in New England. His family derived their origin from Ecton in Northamptonſhire, where his anceſtors had an inconſiderable freehold for many generations. The perſecution of the non-conformiſts in the reign of Charles II. induced his father to take refuge in New England; and in the city of Boſton he followed the occupation of a ſoap-boiler and tallow-chandler. Franklin drew up a hiſtory of his own life from his nativity to the 25th year of his age; but as at that period he had made no very conſpicuous figure in the world, it is to be lamented that we have not the aſſiſtance of his own pen to the meridian of his career. This defect we have endeavoured to ſupply in the ſubſequent narrative from the moſt authentic materials, avoiding as much as poſſible the exaggerated panegyric of friends, and the unmerited detraction of enemies.

Our author, from his very infancy, diſcovered the ſtrongeſt propenſity towards literary purſuits, which determined his father to qualify him for the miniſtry; but he was thwarted in his deſigns by a numerous and increaſing family,

Franklin. family, and therefore Benjamin was taken from ſchool at ten years of age, to take part in the drudgery of his father's trade. This greatly mortified the aſpiring mind of young Franklin, who wiſhed to prefer a ſeafaring life to ſuch an employment; but from this he was diſſuaded by the influence of his father, who was a man of ſome knowledge, and poſſeſſed a ſolid underſtanding. He made it his chief aim to inſpire his children with the love of knowledge and the principles of moral rectitude. He had few books; yet from among theſe Benjamin ſelected a number of voyages and travels, as well as different hiſtories, a ſpecies of reading for which he had a ſtrong predilection. By going through a courſe of controverſial divinity in this unaided manner, he greatly ſtrengthened his argumentative powers, which was moſt probably all he had in view. Defoe upon Projects, according to his own account, made ſuch impreſſions upon his mind as in a great meaſure directed the ſubſequent events of his life.

He was now choſen to an employment which accorded much better with the natural bent of his mind than the buſineſs of his father's ſhop. A brother of his own had a printing-office in Boſton, to whom Benjamin was bound apprentice at 12 years of age. With the mechanical part of the buſineſs he was ſoon acquainted; and the opportunities thus afforded him of procuring new books to read, were eagerly ſeized, and the greater part of the night frequently ſpent in the peruſal of them. He ſoon became anxious to imitate the works which he moſt admired, and his firſt attempts were of a poetical nature. He compoſed and printed ballads, which were well received by thoſe who love ſuch a ſpecies of reading; yet his father had the addreſs to convince him that nature never deſigned him for a poet. He therefore turned his whole attention to the cultivation of proſe compoſition, in which he ſucceeded infinitely better; and he thus became ſuperior to his brethren of the preſs, and raiſed himſelf to ſtations of public importance. As his paſſion for reading and writing was very ſtrong, ſo he became in a ſhort time a powerful diſputant, which was ſtrengthened by his intimacy with a young man of a ſimilar diſpoſition. He peruſed, with uncommon attention, a tranſlation of Xenophon's Memorabilia, which enabled him either to confute or confound an adverſary by a number of queſtions. It is alſo certain that he became a ſceptic as to the religion in which he had been educated, and propagated his unbelief with zeal and aſſiduity. The fatal conſequences which this produced on the deportment of ſome of his intimate companions, at length happily convinced him that it is extremely dangerous to deſtroy the ſalutary influence of religion, without being able to ſubſtitute any thing in its place of equal importance and efficacy. He ſeems, however, to have continued a ſceptic in his own mind, yet he ſtill retained a love for moral rectitude, which led him to adopt honourable means in the proſecution of valuable ends. Much to his honour be it ſpoken, he acquired, at a very early period of life, that triumph over his ſenſual appetites, which is ſo eſſentially neceſſary to a life of dignity, uſefulneſs, and virtue. Having read Tyron's recommendation of a vegetable diet, at 16 years of age, he abandoned the uſe of animal food; and on offering to his brother to ſupport himſelf on half the money which was paid for his board, he was allowed to adopt his own plan, by which means he was enabled to ſave a conſiderable ſum for the purchaſe of books. Although he relaxed conſiderably as to a vegetable diet, yet he thus acquired the habit of being ſatisfied with little, and a contempt of the gratifications of the palate was frequently of ſingular advantage to him through the whole of life. Franklin.

When his brother began a newſpaper, Benjamin ſent a number of pieces on various topics to be inſerted, which met with the aprobation of the moſt competent judges;—a ſatisfaction he enjoyed without being known, as they were all anonymous. His brother treated him with the harſhneſs of a maſter, which he bore with the utmoſt impatience, as the public had already pronounced him to be poſſeſſed of merit. The ſtates of America having prohibited James Franklin from publiſhing this paper, on account of ſome political offence, the name of Benjamin was employed as publiſher, in conſequence of which he procured his indentures, although he agreed privately with his brother to ſerve out his time. But as he did not deem this agreement obligatory, he went to New York by ſea, and from that place to Philadelphia, in the ſeventeenth year of his age. He himſelf acknowledges this to have been a fault, and therefore has averted that cenſure which he would otherwiſe have deſerved. At Philadelphia he engaged with a printer of the name of Keimer, whoſe affairs he ſoon placed on a more reſpectable footing; and here alſo he became acquainted with ſeveral young men of a literary turn of mind, by whoſe company his taſte for knowledge was greatly improved.

He ſoon after became acquainted with Sir William Keith the governor of that province, who powerfully recommended it to him to commence buſineſs on his own account, and promiſed to give him all the encouragement in his power. Encouraged by this gentleman to adopt ſuch a plan, he ſet out for Boſton on a viſit to his parents, in order to procure from them ſome pecuniary aid; but a welcome reception was all he could obtain. Having returned to Philadelphia, Sir William generouſly offered to take the whole burden upon himſelf, and adviſed Franklin to make a voyage to England, in order to procure every thing neceſſary for a printing-office. He ſet ſail in the year 1725, and took with him his intimate companion Ralph, whoſe name has been rendered memorable by being celebrated in the Dunciad. Unfortunately for Franklin, Sir William Keith, on whoſe letters of recommendation and credit he entirely relied, baſely deceived him, and he was obliged to work as a journeyman in London for his immediate ſubſiſtence. His friend Ralph could only live by his head, and his income of conſequence was extremely circumſcribed, as well as precarious, which made him a heavy burden on the pocket of Benjamin. In that diſſolute metropolis the one forgot his wife and child in America, and the other the ſolemn promiſes of fidelity which he had made to a Miſs Read, prior to his departure;—another ſtep of his conduct which he himſelf ſeverely cenſures. By a diſſertation on liberty and neceſſity, pleaſure and pain, he acquired conſiderable reputation, and it was the means of introducing him to the celebrated Dr Mandeville, author of the Fable of the Bees. In the ſecond printing-office in which he worked, he laboured inceſſantly to convince his fellow workmen that a pint of porter does not contain half

Franklin. half ſo much nouriſhment as a penny roll, for which he obtained the ludicrous epithet of the *American aquatic;* yet he was finally enabled to make many converts to his doctrine;—a proof that he poſſeſſed ſtrong perſuaſive powers, when we conſider the deep-rooted attachment of thoſe with whom he had to treat to their favourite libation.

After eighteen months reſidence in London, he returned to Philadelphia in the year 1726, and became clerk to a Mr Denham, a man of reſpectability, who had opened a warehouſe in that city. He ſoon became acquainted with the principles of commerce, and led a very happy life in this new ſituation, till the connection was diſſolved by the death of Mr Denham, which happened the following year. This again obliged him to become journeyman printer, and he was afterwards overſeer in the office of Keimer, whom we have already mentioned. Here he acquired great eſteem, and at length conceived the idea of ſetting up for himſelf, which he accompliſhed by entering into partnerſhip with one Meredith, a fellow workman, whoſe father was in circumſtances to enable him to advance them ſome money. His induſtry was habitual, but the idea that he was now working for himſelf, gave it additional energy. He was chiefly inſtrumental in the inſtitution of a club which went by the name of the *junto*, and which was highly conducive to the intellectual improvement of its members. Before the admiſſion of a candidate, the following queſtions were put to him. "Do you ſincerely declare that you love mankind in general, of what profeſſion or religion ſoever? Do you think any perſon ought to be harmed in his body, name, or goods, for mere ſpeculative opinions, or his external way of worſhip? Do you love truth for truth's ſake; and will you endeavour impartially to find and receive it yourſelf, and communicate it to others?" Franklin and his copartner began a newſpaper, which the labours and talents of the former brought into repute, and by them the votes and laws of the aſſembly came afterwards to be printed. The partnerſhip being diſſolved by the departure of Meredith, Franklin, by the generous aid of friends, was enabled to take the whole buſineſs upon himſelf, to which he added the buſineſs of a ſtationer. When the increaſe of paper money engaged the attention of the American government, Franklin wrote an anonymous pamphlet in defence of the meaſure, by which he acquired conſiderable reputation, the countenance of men in power, and it placed his proſperity on a permanent baſis. About this time he kept up a criminal correſpondence with different females, chiefly owing, perhaps, to the diſappointment he met with in the firſt object of his love, Miſs Read, who by this time was married to another in conſequence of his neglect. But we forgot the faults of the man in the ingenuous confeſſion of the penitent. A report prevailing that Miſs Read's huſband was married to another woman, he retired to the Weſt Indies where he died, and Franklin married the object of his firſt love in the month of September 1736, being then about 24 years of age. She proved a valuable wife, and in every ſenſe of the word, an "help meet for him."

To him we are to aſcribe the eſtabliſhment of a public library at Philadelphia, which he accompliſhed in the year 1731, and had the ſatisfaction of ſeeing it arrive at that flouriſhing condition which it has long ſince attained. His "Poor Richard's Almanac," was begun in 1732, and became remarkable for the many prudential maxims with which it abounded; and the proverbial manner in which they were expreſſed made them take faſt hold of the memory. His political career commenced in 1736, when he was choſen clerk to the general aſſembly of Pennſylvania, to which he was re-elected for ſeveral years, and at laſt became a repreſentative. In 1737, he was made poſtmaſter of Philadelphia, and in the ſubſequent year he greatly improved the police of the city, by the formation of a fire-company, and afterwards an inſurance-company againſt loſſes by fire. In the war with France, which broke out in 1744, when the beſt means of defending the province againſt the inroads of the enemy, and when the militia bill was thrown aſide from its being obnoxious to the people, Franklin ſuggeſted the idea of a voluntary aſſociation for their mutual defence, which was inſtantly ſigned by 1200 perſons, and 10,000 ſubſcriptions were obtained in a ſhort time by circulating it through the province. By this and ſimilar means America had an opportunity of aſcertaining her own ſtrength, and how to make uſe of it with advantage in caſes of emergency. Franklin.

About this time he began his intereſting experiments on electricity, by the reſult of which he juſtly acquired a diſtinguiſhed reputation. The library ſociety of Philadelphia having received from Mr Peter Collinſon in the year 1745, an account of the facts reſpecting electricity which at that time engroſſed the attention of philoſophers in Europe, Franklin ſet about ſtudying the ſubject with the greateſt aſſiduity. He gave the account of his reſearches, the title of "New experiments and obſervations on electricity, made at Philadelphia in America," and addreſſed to Mr Collinſon in the form of letters, bearing date from 1747 to 1754. They were everywhere read with avidity, and univerſally admired; Dr Prieſtley ſpeaks of them in the following terms. "It is not eaſy to ſay whether we are moſt pleaſed with the ſimplicity and perſpicuity with which the author propoſes every hypotheſis of his own, or the noble frankneſs with which he relates his miſtakes, when they were corrected by ſubſequent experiments." Not to ſwell this article with a detailed account of all his diſcoveries on this ſubject, we ſhall content ourſelves with mentioning that moſt intereſting of the whole, his grand diſcovery that lightning and electric fire are identically the ſame. This identity had begun to be ſuſpected, and experiments had been made in France to aſcertain the fact; but it was reſerved to Franklin to demonſtrate this fact by his own experiments. He obtained his firſt deciſive proof of this in the month of June 1752, by ſetting up a ſilken kite into the air with a point of iron, and a key faſtened to the end of the hempen ſtring by which he held it. In this manner he drew down from a thunder cloud a ſufficient quantity of electric fire to emit ſenſible ſparks from the key. By means of an inſulated iron rod which he fixed upon his houſe, he drew down the lightning, and was thus furniſhed with an opportunity of diſcovering whether it was poſitive or negative. As he firmly believed that philoſophical diſcoveries were only valuable in ſo far as they could be productive of benefit to man, he made them ſubſervient to the protection of buildings from the

effects

Franklin. effects of lightning, which are truly alarming in North America. He applied phyſics to the purpoſes of common life, and in 1745 invented his Pennſylvania fire-places, in which the qualities of an open grate were combined with that of a ſtove.

He turned his attention very much to the ſubject of politics, which was extremely natural for a man of a public ſpirit living under a popular government. He was choſen a repreſentative of the city of Philadelphia for the provincial aſſembly in 1747. At this time a conteſt ſubſiſted between the aſſembly and the proprietaries, as to the claim of the latter to be exempted from public burdens. Franklin took the popular ſide of the queſtion, by which he acquired great influence, and was regarded as the head of the oppoſition. This was not the offspring of eloquence, for he ſeldom ſpoke, and never in the form of an harangue; but his pointed obſervations, his unadorned good ſenſe, frequently deſtroyed the effect of the moſt elaborate orations.

He drew up the plan of an academy to be founded at Philadelphia, from a conviction that education in a free ſtate is of the utmoſt importance. It was carried into effect in the year 1750, by virtue of a ſubſcription, to which the proprietors afterwards liberally contributed. He diſcharged the duties of his office as poſtmaſter of Philadelphia with ſo much punctuality, that he was appointed deputy poſtmaſter general for the Britiſh colonies in 1753, and the revenue was ſoon bettered by his unwearied exertions. A plan for conciliating the Indians, and forming an alliance with them, was drawn up by Franklin in 1754, to which the commiſſioners at Albany agreed, and a copy of it was tranſmitted to the Britiſh privy council. It is a ſingular circumſtance, that this plan was rejected by the aſſemblies as giving too much power to the crown, while the Britiſh miniſtry declared that it gave too much influence to the repreſentatives of the people. In the year 1757, Franklin ſet ſail for London, as agent for Pennſylvania, the aſſembly of that province being involved in diſputes with the proprietary. It was agreed on by the privy council, that landholders ſhould pay their ſhare of the public burdens, on condition Franklin would engage that they ſhould be fairly proportioned. He continued at the Britiſh court as agent for his province, and acquired ſo great reputation, that the ſame truſt was repoſed in him for Maſſachuſets, Maryland, and Georgia. His merit as a philoſopher was now juſtly appreciated in Europe, and he was made a fellow of the Royal Society of London. The degree of L. L. D. was alſo conferred upon him at St Andrews, Edinburgh, and Oxford.

In the year 1762 he returned to America, where he received the thanks of the aſſembly of Pennſylvania, and a handſome recompenſe in money for his important ſervices. When the ſtamp act occaſioned ſo much diſturbance in America, Dr Franklin was ſummoned to the bar of the houſe of commons, to give evidence reſpecting the diſpoſitions of the people, whether he thought they could be induced to ſubmit to it; and the energy and clearneſs of his repreſentations were inſtrumental in procuring the repeal of that obnoxious meaſure.

On the commencement of hoſtilities between Great Britain and the colonies in 1775, he returned to America, and was choſen a delegate to congreſs by the legiſlature of Pennſylvania. In 1776 he treated with Lord Howe on the ſubject of a reconciliation, and in one of his letters expreſſed in ſtrong terms the temper of the Britiſh nation, to which he imputed the fatal extremity then arrived. When the queſtion of independence came to be diſcuſſed, he was decidedly in favour of the meaſure, and was highly inſtrumental in bringing over the public mind to the ſame opinion. When a negociation with France was opened, Dr Franklin was choſen one of the perſonages to reſide at that court. His political abilities eminently qualified him for ſuch a ſtation, and his character as a philoſopher gained him great eſteem in a country where knowledge is revered. He brought about a treaty with France of an offenſive and defenſive nature in 1778, the immediate conſequence of which was a war with Britain. He was one of thoſe who ſigned the proviſional treaty the year following. Prior to his leaving Europe he concluded a treaty with Sweden and Pruſſia. He was recalled from that active ſtation in 1785, which he had filled with ſo much ability, and choſen preſident of the ſupreme executive council. He was choſen preſident of a ſociety for alleviating the miſeries of priſons, and aboliſhing ſlavery. His increaſing infirmities made him withdraw from all public buſineſs in 1788; and on April the 17th 1790, he terminated his active and uſeful life, in the 85th year of his age. Frank.

Perhaps no man ever exceeded Dr Franklin in that ſolid practical wiſdom which conſiſts in purſuing valuable ends by the moſt appropriate means. His cool temper and ſound judgment ſecured him from erroneous expectations. He ſaw things in their true light, and predicted conſequences with nearly a prophetic ſpirit. He ſaid of himſelf "I have always ſet a greater value on the character of a *doer of good*, than any other kind of reputation." In 1779, his "Political, Miſcellaneous, and Philoſophical pieces," were publiſhed in 4to and 8vo. His eſſays, humorous, moral, and literary, were publiſhed after his death, in two ſmall volumes.

He was by no means inattentive to his own intereſt, of which his rapid advancement in life furniſhes an ample proof; yet he never neglected the intereſt of ſociety, or the good of mankind in general. The delicate ſituations in which he frequently ſtood, unavoidably expoſed him to the cenſure of his enemies; yet his general conduct has long ago received the approbation of his countrymen, by whom he was conſidered as the beſt and moſt valuable of citizens. When we view him as a philoſopher, we muſt aſcribe his chief merit to his electrical diſcoveries, yet on many other topics, ſuch as meteorology and mechanics, he evinced himſelf a man of conſiderable penetration. As a political writer, his great merit is clearneſs, energy, and ſimplicity; and as a miſcellaneous author he poſſeſſes a fund of humour which cannot fail to be at once both entertaining and impreſſive.

FRANKLIN, the name of ſeveral counties in America, ſuch as Franklin county in Pennſylvania, computed to contain 800 ſquare miles, or 512,000 acres. It contains 11 townſhips, and 15,655 inhabitants. Franklin, a county in Kentucky; the name of one in Halifax, of one in Virginia, and of another in Georgia, which contains 1041 inhabitants, including 156 ſlaves. It is alſo the name of a townſhip in Maſſachuſets; of one in Pennſylvania, another in New York, and of another in Connecticut,

anklin || nternal.

Connecticut, as well as of a ſmall iſle at the mouth of St George's river.

FRANKS, FRANCS, FRANKIS, or FRANQUIS, a name which the Turks, Arabs, Greeks, &c. give to all the people of the weſtern parts of Europe. The appellation is commonly ſuppoſed to have had its riſe in Aſia, at the time of the croiſades; when the French made the moſt conſiderable figure among the croiſees: from which time the Turks, Saracens, Greeks, Abyſſinians, &c. uſed it as a common term for all the Chriſtians of Europe; and called Europe itſelf *Frankiſtan*. The Arabs and Mahometans, ſays M. d'Herbelot, apply the term *Franks* not only to the French (to whom the name originally belonged), but alſo to the Latins and Europeans in general.

But F. Goar, in his notes on Condinus, cap. 5. n. 43. furniſhes another origin of the appellation *Franks*, of greater antiquity than the former. He obſerves, that the Greeks at firſt confined the name to the *Franci*, i. e. the German nations, who had ſettled themſelves in France or Gaul; but afterwards they gave the ſame name to the Apulians and Calabrians, after they had been conquered by the Normans; and at length the name was farther extended to all the Latins.

In this ſenſe is the word uſed by ſeveral Greek writers; as Comnenus, &c. who to diſtinguiſh the French, call them the *weſtern Franks*. Du Cange adds, that about the time of Charlemague they diſtinguiſhed eaſtern France, weſtern France, Latin or Roman France, and German France, which was the ancient France, afterwards called *Franconia*.

FRASCATI, or FRESCATI. See FRESCATI.

FRASERSBURGH, a ſmall ſea-port town in the county of Aberdeen, ſituated on the point of land called *Kinnaird's Head*, which is the ſouthern extremity of the Murray frith. It has a ſmall but excellent harbour, made and kept up at a conſiderable expence by the proprietor and the town, and well adapted for building ſmall veſſels. According to the tide, there are from 11 to 15 feet water within the harbour, and 20 feet immediately without at ſpring tides: without is a tolerable road for ſhipping, in a bay nearly a league in length and half a league in breadth, with good anchorage in a ſandy bottom. Veſſels of about 200 tons burden can enter the harbour. Fraſerſburgh contains about 1000 inhabitants, and is well ſituated for trade with the eaſt coaſt of Europe. The only manufacture carried on in Fraſerſburgh is in linen yarn, of which there is annually exported to the amount of 3000l. or 4000l.

FRATERNAL, ſomething belonging to the relation of brother.

FRATERNAL Affection is the love and attachment ſubſiſting among, or due to one another by, children of the ſame family.

Though all mankind ſprung from the ſame head, are bound to cultivate a mutual good will to each other; yet this duty is not ſo obvious and ſtriking as that which is incumbent on thoſe who belong to the ſame family. Nothing can approach nearer to ſelf love than fraternal affection: and there is but a ſhort remove from our own concerns and happineſs, to theirs who come from the ſame ſtock, and are partakers of the ſame blood. Nothing, therefore, can be more horrible than diſcord and animoſity among members ſo allied; and nothing ſo beautiful as harmony and love.

This relation is formed by nature, not by choice; and though it has many things in common with, yet it is prior to, the obligations of friendſhip: conſequently nature and reaſon dictate that there ſhould be a peculiar affection between brethren. We are not obliged, however, to make a brother or ſiſter an intimate or boſom friend in preference to one who is not akin. Diverſity of temper, and want of ſuitable qualifications, may render it unſafe and improper. But where friendſhip and fraternity meet in the ſame perſons, ſuch a conjunction adds a luſtre to the relation.

Fraternal || Fratricelli.

Among brethren, a hearty benevolence, an ardent concern for each other's welfare, a readineſs to ſerve and promote it, are the peculiar offices of this relation; and though friends are to have their ſhare, yet the claim of kindred is firſt and ordinarily ſtrongeſt. "Neceſſaria præſidia vitæ debentur iis maxime (ſays Cicero), quos ante dixi, i. e. propinquis): vita autem, victuſque communis, concilia, ſermones, &c. in amicitiis vigent maxime." *De Officiis*.

FRATERNITY, BROTHERHOOD, the relation or union of brothers, friends, partners, aſſociates, &c.

FRATERNITY, in a civil ſenſe, is uſed for a guild, aſſociation, or ſociety of perſons, united into a body, for ſome common intereſt or advantage. See COMPANY and GUILD.

FRATERNITY, in the Roman Catholic countries, ſignifies a ſociety for the improvement of devotion. Of theſe there are ſeveral ſorts; as, 1. The fraternity of the roſary, founded by St Dominic. It is divided into two branches, called the *common roſary*, and the *perpetual roſary*; the former of whom are obliged to confeſs and communicate every firſt Sunday in the month, and the latter to repeat the roſary continually. 2. The fraternity of the ſcapulary, whom the bleſſed Virgin, according to the ſabbatine bull of Pope John XXII. has promiſed to deliver out of hell the firſt Sunday after their death. 3. The fraternity of St Francis's girdle, are clothed with a ſack of a gray colour, which they tie with a cord, and in proceſſions walk barefooted, carrying in their hands a wooden croſs.—4. That of St Auſtin's leathern girdle comprehends a great many devotees. Italy, Spain, and Portugal, are the countries where one ſees the greateſt number of theſe fraternities, ſome of which aſſume the name of *arch-fraternities*. Pope Clement VII. inſtituted the arch-fraternity of charity, which diſtributes bread every Sunday among the poor, and gives portions to 40 poor girls on the feaſt of St Jerome their patron. The fraternity of death buries ſuch dead as are abandoned by their relations, and cauſes maſſes to be celebrated for them.

FRÂTRES ARVALES. See ARVALES.

FRATRIAGE, the partition among brothers, or coheirs, coming to the ſame inheritance or ſucceſſion.

FRATRICELLI, in eccleſiaſtical hiſtory, an enthuſiaſtic ſect of Franciſcans, which roſe in Italy, and particularly in the marquiſate of Ancona, about the year 1294. The word is an Italian diminutive, ſignifying *fraterculi*, or "little brothers;" and was here uſed as a term of deriſion, as they were moſt of them apoſtate monks, whom the Italians call *fratelli*, or *fratricelli*. For this reaſon the term *fratricelli*, as a nickname, was given to many other ſects, as the Catharists, the Waldenſes, &c. however different in their opinions and in their conduct. But this denomination applied to

Fratricelli, Fratricide.

the auſtere part of the Franciſcans was conſidered as honourable. See FRANCISCANS.

The founders were P. Maurato, and P. de Foſſombroni, who having obtained of Pope Celeſtin V. a permiſſion to live in ſolitude, after the manner of hermits, and to obſerve the rule of St Francis in all its rigour, ſeveral idle vagabond monks joined them, who, living after their own fancies, and making all perfection to conſiſt in poverty, were ſoon condemned by Pope Boniface VIII. and his ſucceſſor, and the inquiſitors ordered to proceed againſt them as heretics: which commiſſion they executed with their uſual barbarity. Upon this, retiring into Sicily, Peter John Oliva de Serignan had no ſooner publiſhed his Comment on the Apocalypſe, than they adopted his errors. They foretold the reformation of the church, and the reſtoration of the true goſpel of Chriſt, by the genuine followers of St Francis, and declared their aſſent to almoſt all the doctrines which were publiſhed under the name of the abbot Joachim, in the "Introduction to the everlaſting Goſpel," a book publiſhed in 1520, and explained by one of the ſpiritual friars whoſe name was Gerhard. Among other enormities inculcated in this book, it is pretended that St Francis was the angel mentioned in Rev. xiv. 6. and had promulgated to the world the true and everlaſting Goſpel of God; that the Goſpel of Chriſt was to be abrogated in 1260, and to give place to this new and everlaſting Goſpel, which was to be ſubſtituted in its room; and that the miniſters of this great reformation were to be humble and bare-footed friars, deſtitute of all worldly employments. Some ſay they even elected a pope of their church; at leaſt they appointed a general, with ſuperiors, and built monaſteries, &c. Beſides the opinions of Oliva, they held, that the ſacraments of the church were invalid; becauſe thoſe who adminiſtered them had no longer any power or juriſdiction. They were condemned afreſh by Pope John XXII. in conſequence of whoſe cruelty they regarded him as the true antichriſt; but ſeveral of them returning into Germany, were ſheltered by Lewis, duke of Bavaria, the emperor.

There are authentic records, from which it appears that no leſs than 2000 perſons were burnt by the inquiſition, from the year 1318 to the time of Innocent VI. for their inflexible attachment to the poverty of St Francis. The ſeverities againſt them were again revived towards the cloſe of the 15th century by Pope Nicolas V. and his ſucceſſors. However, all the perſecutions which this ſect endured were not ſufficient to extinguiſh it; for it ſubſiſted until the times of the reformation in Germany, when its remaining votaries adopted the cauſe and embraced the doctrine and diſcipline of Luther. And this has led popiſh writers to charge the Fratricelli with many enormities, ſome of which are recounted by M. Bayle, art. *Fratricelli*.

The Fratricelli had divers other denominations: they were called *fratricelli*, according to ſome, becauſe they lived in community, in imitation of the primitive Chriſtians, or rather through the humility of the founder of the Franciſcan order, to which the Fratricelli originally belonged; *Dulcini*, from one of their doctors; *Bizochi*, *Beguini*, and *Beghardi*.

FRATRICIDE, the crime of murdering one's brother. See PARRICIDE.

Fraud ‖ Freats.

FRAUD, in *Law*, ſignifies deceit in grants or conveyances of lands, &c. or in bargains and ſales of goods, &c. to the damage of another perſon.

A fraudulent conveyance of lands or goods to deceive creditors, as to creditors is void in law. And a fraudulent conveyance in order to defraud purchaſers, is alſo to ſuch purchaſers void; and the perſons juſtifying or putting off ſuch grants as good, ſhall forfeit a year's value of the lands, and the full value of the goods and chattels, and likewiſe ſhall be impriſoned. See CHEATING.

FRAUSTADT, a town of Sileſia, on the frontiers of Poland, remarkable for a battle gained by the Swedes over the Saxons in 1706. It is 70 miles N.N.W. of Breſlau. E. Long. 15. 50. N. Lat. 51. 45.

FRAXINELLA. See DICTAMNUS, BOTANY *Index*.—It is remarkable of this odorous plant, that, when in full bloſſom, the air which ſurrounds it in a ſtill night may be inflamed by the approach of a lighted candle. Dr Watſon doubts whether this inflammability proceeds from an inflammable air which is exhaled by the plant, or from ſome of the finer parts of the eſſential oil of the plant being diſſolved in the common atmoſpherical air. The latter is the moſt probable ſuppoſition; for were it the pure inflammable air, as Mr Cavallo obſerves, it would, on account of its ſmall ſpecific gravity, leave the plant as ſoon as it was produced. Common air acquires the property of becoming inflammable, by being tranſmitted through ſeveral eſſential oils.

FRAXINUS, the ASH; a genus of plants belonging to the polygamia claſs; and in the natural method ranking under the 44th order, *Sepiariæ*. See BOTANY *Index*.

FRAY literally ſignifies to fret; as cloth or ſtuff does by rubbing, or over much wearing.

Among hunters a deer is ſaid to fray his head, when he rubs it againſt a tree, to cauſe the ſkins of his new horns to come off.

FREA, or FRIGGA, the wife of Odin, was, next to him, the moſt revered divinity among the Heathen Saxons, Danes, and other northern nations. As Odin was believed to be the father, Frea was eſteemed the mother of all the other gods. In the moſt ancient times, Frea was the ſame with the goddeſs Herthus, or Earth, who was ſo devoutly worſhipped by the Angli and other German nations. But when Odin, the conqueror of the north, uſurped the honours due only to the true Odin, his wife Frea uſurped thoſe which had been formerly paid to mother Earth. She was worſhipped as the goddeſs of love and pleaſure, who beſtowed on her votaries a variety of delights, particularly happy marriages and eaſy childbirths. To Frea the ſixth day of the week was conſecrated, which ſtill bears her name.

FREAM, a name given by farmers to ploughed land worn out of heart, and laid fallow till it recover.

FREATS, or FREITS, a term uſed in Scotland for *ill omens*, and ſometimes denoting accidents ſupernaturally unlucky. King James VI. in his *Dæmonologie*, *MS. pen. Edit.* B. I. ch. iv. p. 13. "But I pray you forget not likeways to tell what are the Devill's rudiments? E. His rudiments I call firſt in general all that quhilk is called vulgairelie the virtu of woode, herbe,

herbe, and ſtaine; quhilk is uſed by unlawful charmis without natural cauſis. As lykeways all kynd of pratiques, *freitis, or other lyk extraordinair actions, quilk cannot abyde the trew twiche of naturall raiſon.* It occurs again in the ſame ſenſe in p. 14. *marg. note;* and in p. 51. ſpeaking of *Sorcerers*, "And in generall that naime was gevin thaime for uſing of ſic chairmis and *freitis*, as that craft teachis thaime."

FRECKLES, LENTIGINES, ſpots of a yellowiſh colour, of the bigneſs of a lentile ſeed, ſcattered over the face, neck, and hands. Freckles are either natural, or proceeding accidentally from the jaundice or the action of the ſun upon the part. Heat or a ſudden change of the weather, will often cauſe the ſkin to appear of a darker colour than natural; and thereby produce what is called *tan, ſunburn*, and *morphew*, which ſeem to differ only in degree; and uſually diſappear in winter.

Perſons of a fine complexion, and whoſe hair is red, are the moſt ſubject to freckles, eſpecially in thoſe parts which they expoſe to the air.

To remove freckles, put juice of lemons in a glaſs phial, and mixing it with ſugar and borax finely powdered, let it digeſt eight days, and then uſe it. Homberg propoſes bullocks gall mixed with alum, and, after the alum has precipitated, expoſed three or four months to the ſun in a cloſe phial, as one of the beſt remedies known for the removing of freckles.

FREDBERG. See FREYBERG.

FREDERICA, a town of North America, in Georgia, ſeated at the mouth of the river Alatamaha. It was founded by General Oglethorpe. The iſland it ſtands upon is called *St Simons's;* and is about 13 miles in length, and 4 in breadth. W. Long. 81. 25. N. Lat. 31. 13.

FREDERICK II. the Great, of Pruſſia, one of the greateſt warriors of the age in which he lived, was the ſon of Frederick-William then hereditary prince of Brandenburg, and Maria Dorothea a princeſs of the houſe of Brunſwick. He was born in 1712, the year before his father Frederick I. mounted the throne of Pruſſia. The latter was ſo far from being a patron of literature, that he regarded nothing but what related to the military art; and moſt of his generals, whatever their merits in their own line might be, ſcarce knew how to ſign their names. So great indeed was the ignorance of the monarch himſelf, that he baniſhed from his dominions a philoſopher of the name of *Wolf*, merely becauſe he maintained the doctrine of pre-eſtabliſhed harmony; upon which a theologian named *Lange*, aſſerted, that on ſuch principles his majeſty's grenadiers were not culpable when they deſerted, it being only the neceſſary conſequence of the impulſe their machine had received from their Creator. His ſon was of a diſpoſition the very reverſe of his father. Being put from his birth under the care of Val de Recoule a French lady of great merit and underſtanding, he acquired, in his early years, not only a taſte for literature in general, but a predilection for the French language, which was not obliterated throughout his whole life.

It is not to be ſuppoſed that a prince of the diſpoſition above mentioned, would ſuffer his ſon to be long engaged in literary purſuits. At ſeven years of age, young Frederick was taken out of the hands of Madame de Recoule, and put under the care of military tutors. General count de Finkeſtein, an old warrior, was appointed his governor; his ſub-governor was Colonel de Kalkſtein, an officer renowned for his courage and experience; he was taught mathematics and fortification by Major Senning; Han de Jendun, a Frenchman, inſtructed him in other branches of knowledge; and a cadet of the name of *Kenzel*, taught him his exerciſe. At eight years of age he was furniſhed with a ſmall arſenal ſtored with all ſorts of arms proportioned to his age and ſtrength, of which his father left him abſolute maſter. In a ſhort time he was named captain and chief of the corps of cadets; and, the young prince performed every day, in miniature, with his little ſoldiers, all the evolutions with which his father exerciſed his giants. At laſt he received the command of a company in his father's regiment famous throughout all Europe, and which was compoſed of men of whom ſcarce one was ſhort of ſeven French feet. Frederick.

Born, however, with a taſte for the arts, he devoted to their cultivation every moment he could eſcape from the vigilance of his guardians. He was more particularly fond of poetry and muſic, and when he could find a moment's leiſure, he read French authors, or played on the flute; but his father as often as he ſurpriſed him playing or reading, broke his flute and threw his books into the fire. The prince, chagrined at ſuch injurious treatment, and having a great deſire to viſit Germany, England, France, and Italy, deſired permiſſion to travel. This, however, his father would not allow, but permitted him to accompany himſelf in the little journeys he made from time to time into Germany; and, in 1728, took him to Dreſden to ſee the king of Poland. By theſe little expeditions the deſire of the prince to viſit other countries was only the more inflamed, ſo that at laſt he formed a deſign of ſetting out without his father's knowledge. The deſign was intruſted to two of the prince's young friends, named *Kat* and *Keit;* money was borrowed for the occaſion, and the day of their departure fixed, when unluckily the whole project was diſcovered. The old king, implacable in his reſentment, and conſidering his ſon as a deſerter, determined to put him to death. He was ſhut up in the fortreſs of Cuſtrin; and it was with the utmoſt difficulty that the count de Seckendorf, ſent for the purpoſe by the emperor Charles VI. was able to alter the king's reſolution. Certain vengeance, however, was determined on both the intended aſſociates in Frederick's journey. Keit eſcaped the danger by flying into Holland; but Kat had not that good fortune. The king firſt directed that he ſhould be tried by a court martial; but as they, contrary to his expectation, only ſentenced the criminal to perpetual impriſonment, the revengeful monarch by an unheard-of exerciſe of the royal prerogative cauſed him to be beheaded. The execution was performed under the windows of the prince royal, whoſe head was held towards the ſcaffold by four grenadiers: but no ſooner did he approach the window, and ſee his friend in the hands of the executioner, than he ſtretched out his arms towards him, crying out, "Kat! Kat!" and inſtantly fainted away. During the remainder of his life he conſidered capital puniſhments with a great degree of horror, and they were rare throughout the Pruſſian dominions while he continued to reign. When the emperor had ſucceeded in preventing the execution of Frederick, the king remarked, that

Frederick. "Auſtria would one day ſee what a ſerpent ſhe had nouriſhed in her boſom." The royal priſoner remained a year at Cuſtrin; during which time his father wiſhed that he ſhould learn the maxims of government and finance. For this purpoſe, M. de Munchow, preſident of the chamber of domains and finances, was ordered to make him aſſiſt at all their aſſemblies, to conſider him as a ſimple counſellor, to treat him as ſuch, and make him work like others. The young counſellor, however, though he aſſiſted at their meetings, did not trouble himſelf with reading acts or copying decrees. Inſtead of this, he amuſed himſelf ſometimes with reading French pamphlets, and at others with drawing caricatures of the preſident or members of the aſſembly. M. Munchow himſelf was likewiſe very favourable to the prince at this time, by furniſhing him with books and other articles of amuſement, notwithſtanding the expreſs prohibition of his father; though in this he certainly ran great riſk; for the old king, who ſet but a very light value on human life, would undoubtedly have put him to death had he received intelligence of his complaiſance.

Frederick, after paſſing the time above mentioned in confinement, was recalled to Berlin, on pretence of being preſent at the celebration of his eldeſt ſiſter's marriage with the hereditary prince of Bareith; but the true reaſon was, that the king had now prepared a match for the prince himſelf. This was the princeſs Elizabeth Chriſtina of Burnſwick, niece to the empreſs. Frederick, who was not only totally indifferent to the fair ſex in general, but particularly prejudiced againſt this princeſs, made ſome objections; his father, however, overcame all obſtacles with "his uſual arguments (ſays the author of the life of Frederick), viz. his cane, and a few kicks."

The coldneſs which Frederick at this time ſhowed for the fair ſex appears not to have been natural; for as early as the year 1723, though then only in the 11th year of his age, he is ſaid to have fallen in love with the princeſs Anne, daughter of George II. Even at this early period he entered into vows to refuſe every other but her for his conſort; nor were theſe ever broken, as far as depended on himſelf. The marriage perhaps would have taken place, had it not been for ſome differences which aroſe between the courts of Pruſſia and Hanover about a few acres of meadow land, and two or three Hanoverians inliſted by the Pruſſian recruiters. It is ſuppoſed alſo, that it was intended at one time to marry him to Maria Thereſa of Auſtria; but, as in that caſe it would have been neceſſary to change his religion, Frederick derived from thence a plauſible pretence for refuſing the match. The princeſs whom he eſpouſed had a large ſhare of beauty; and, what was ſtill better, an excellent heart: but Frederick is ſaid to have ſuffered ſo much in his former amours that, certain natural and unſurmountable impediments remained to the completing of his marriage with any woman. Scarcely therefore was he in bed with his young ſpouſe, when a cry of *Fire!* was raiſed by his friends. Frederick got up to ſee where the conflagration was: but finding it to be a falſe alarm, he ſent meſſengers to compoſe the princeſs; but neither that night, nor any other, did he think proper to diſturb her reſt.

On occaſion of this marriage, Frederick received from his father the county of Rupin. He reſided in the capital of this county, named alſo *Rupin*, for ſome time; but afterwards choſe Rheinſberg for his place of abode. This is a little town built in the ſands, on the confines of Mecklenburg, and at that time containing only 1000 inhabitants; but it was ſoon greatly improved by Frederick. Having put over the great gate of the caſtle, however, the following inſcription, FREDERICO TRANQUILLITATEM COLENTI, his father was diſpleaſed with it, and therefore hurried him from his peaceful retreat into the noiſe and tumult of war. At this time the ſucceſſion to the crown of Poland had kindled a general war throughout Europe, and the king of Pruſſia was to ſend 10,000 auxiliaries to the Imperial army, then commanded by Prince Eugene. The king conducted his troops in perſon, and reſolved to take this opportunity of giving his ſon an idea of war. At this time, however, he learnt but little; and only ſaw, as he himſelf expreſſes it, the ſhadow of the great Eugene. That conſummate general, nevertheleſs, did not overlook his merit; but predicted that he would one day be a great captain. Frederick having gone to reconnoitre the lines at Philipſburg, in his return through a very open wood, was expoſed to the cannon of the lines, which thundered inceſſantly. The balls broke a number of branches on every ſide of him: notwithſtanding which, he never cauſed his horſe to move quicker; nor did his hand which held the bridle ever alter its motion even for a moment. He continued to converſe quietly with the generals who attended him, and never ſhowed the ſmalleſt ſign of apprehenſion. Being one night at ſupper with Field-Marſhal Grumkow, the converſation turned on the young Prince Eugene who died on the Rhine; and he was aſked whether that prince would ever have become a great man? Frederick decided in the negative, on account of young Eugene's not having known at any period of his life how to chooſe a friend who dared to tell him the truth.

During this campaign the health of the old king was ſo much impaired, that he was obliged to leave the army; and Frederick, on his return, was for ſome time intruſted with ſigning all the orders in his father's name. On the king's recovery the prince was ſent to Stettin, under the care of the prince of Deſſau, that he might ſee the fortifications of that town. He was afterwards permitted to go to Konigſberg to ſee the unfortunate Staniſlaus, who had taken refuge in that place, and who was no leſs remarkable for his philoſophy and conſtancy than for his misfortunes. With him Frederick remained for ſome weeks, and contracted a friendſhip which was not diſſolved but by the death of Staniſlaus. At laſt he was allowed to return to his peaceful manſion at Rheinſberg, where he remained till the death of his father. In this place his time was occupied alternately by the ſtudy of the ſciences, the cultivation of the arts, and the pleaſures of friendſhip. Philoſophy, hiſtory, politics, and military art, poetry, and muſic, agreeably ſucceeded each other, and had each its ſtated period. The prince paſſed the greateſt part of the day in his library; and the remainder in the ſociety of a ſelect company of agreeable and learned men. The principal of theſe were Chaſot, a French officer; Kayſerling, a gentleman of Courland, on whom the prince beſtowed the name of *Cæſarion;* Jordan, a French refugee; and Knobelſdorf, director of the buildings

Frederick. ings and gardens; but who could converſe on all the arts of deſigning with great taſte and judgment.—In theſe meetings, gaiety generally preſided; there were generals to ſpeak of war, muſicians to form concerts, and excellent painters to decorate the apartments. Whilſt Knobelſdorf was executing landſcapes and laying out the gardens, Peſne was immortalizing himſelf by his ceilings, and Du Buiſſon by his pictures of flowers. The two Grauns compoſed excellent muſic, or directed the orcheſtra; and Benda, one of the firſt violins of Europe, accompanied the prince, who played extremely well on the flute. The morning was uſually dedicated to ſtudy; gaiety and agreeable converſation prevailed at every repaſt; and every evening there was a little concert.—In this retreat Frederick conceived that ardent paſſion for military glory, and the aggrandizement of his kingdom for which he became at laſt ſo remarkable; and here he is ſuppoſed to have formed the moſt ſublime and daring projects. He was fired with a deſire of imitating the celebrated heroes of antiquity, of whom he read in the ancient authors, and for which he ſet apart ſome hours every day. Amongſt the works which he read almoſt every year were Herodotus, Thucydides, Xenophon, Plutarch, Tacitus, Salluſt, Livy, Quintus Curtius, Cornelius Nepos, Valerius Maximus, Polybius, Cæſar, Vegetius, &c. He never ſpoke but with enthuſiaſm of the great warriors of Greece and Rome; and when ſeated on the throne thought he could never diſtinguiſh an able ſoldier in a more honourable manner than by conferring on him a Roman ſirname. Hence he diſtinguiſhed by the name of *Quintus Icilius* M. Guichard, who had written ſome treatiſes on the military art of the ancients; giving him at the ſame time a free battalion. This name of *Quintus Icilius* was retained by M. Guichard as long as he lived.

In his purſuit of glory Frederick found that it was not improper to cultivate the friendſhip of celebrated poets, philoſophers, and others of the literary claſs; for which purpoſe he flattered, commended, and complimented all the moſt celebrated literati of Europe at that time. "The philoſophers (ſays the author of his life) anſwered him as a mad lover writes to his miſtreſs. They wrote to him that he was a great poet, a great philoſopher, the *Solomon* of the north. All theſe hyperboles were printed; and Solomon was not ſorry for it, though he had too much underſtanding to believe in them. Wolf, Rollin, Graveſande, Maupertuis, Algarotti, Voltaire, were honoured with his correſpondence. The laſt eſpecially, accuſtomed to offer up incenſe to the idol of the day, were it tranſported from the dunghill to the altar, did not fail to exalt as the firſt man of the univerſe a prince who was in expectancy of the throne, and who aſſured him that he was the greateſt philoſopher of the age and the firſt poet in the world."

That Frederick might keep up his character with the literati, or perhaps from a real predilection for his principles, he patronized the Apology of Wolf, and had his principal treatiſes tranſlated into French. He even prevailed upon his father to relax a little in favour of that philoſopher. A commiſſion of reformed and Lutheran theologians was appointed in 1736, to examine into the tenets of that unfortunate philoſopher. Wolf was declared innocent, and a letter was ſent to him at Marpourg containing an invitation to return; but the philoſopher did not think proper to make his appearance till the year 1740, when his protector was ſeated on the throne. Frederick.

During his reſidence at Rheinſberg, Frederick compoſed his refutation of the principles of Machiavel, under the title of *Anti-Machiavel*: of which he ſent the manuſcript to Voltaire to correct, and to get printed.

The old king, now almoſt worn out with infirmity, ſaw with regret the predilection his ſon entertained for men of letters; and, in his peeviſh fits, often threatened the whole ſociety with confinement in the fortreſs of Spandau. Theſe threats frequently occaſioned a violent alarm among the joyous company at Rheinſberg, which it required all the eloquence of Frederick to quiet. Their apprehenſions on this account, however, were ſoon removed. At the commencement of the year 1740, the king's diſorder increaſed to a great degree, and in the month of May his caſe became deſperate. He lived, however, till the 31ſt of that month, when he expired, and left the throne to his ſon Frederick II.

The acquiſition of a kingdom did not abate Frederick's paſſion for literature, though to this he was now obliged to ſuperadd the qualities and labours of a great king. A conſideration of his tranſactions in this character falls under the article PRUSSIA, to which we refer: theſe, indeed, ſo totally engroſſed the remaining part of his life, that little more remains to be ſaid under this article, than to relate ſome anecdotes by which we may be in ſome meaſure able to trace the character of this great and ſingular perſonage.

It has already been mentioned, that in the early part of his life, Frederick had conceived a great inclination to travel. This paſſion ſeems not to have been extinguiſhed by the ſplendour of his new ſituation; for having, ſoon after his acceſſion, gone into Pruſſia and Weſtphalia to receive the homage of the inhabitants, he formed a reſolution of proceeding *incognita* as far as Paris. Being diſcovered at Straſbourg, however, he laid aſide the deſign of proceeding to Paris, and went to ſee his ſtates in Lower Germany. Here he wrote the celebrated Voltaire, that he ſhould come *incognita* to viſit him at Bruſſels; but being ſeized with an indiſpoſition in the little palace of Meuſe, two leagues from Cleves, he wrote again to that philoſopher, informing him that he expected he ſhould make the firſt advances. The following curious account is given by him of his reception, &c. "The only guard I found at the gate was one ſoldier. The privy counſellor, Bambonet, was cooling his heels in the court: he had large ruffles of dirty linen; a hat full of holes; and an old magiſterial peruke, one end of which deſcended as low as his pockets, and the other ſcarcely reached his ſhoulder. I was conducted into his majeſty's apartment, where there was nothing but bare walls. I perceived in a cabinet, by the glimmering of a taper, a truckle bed, two feet and a half wide, on which lay a little man muffled up in a night gown of coarſe blue cloth. This was the king, in a ſtrong perſpiration, and even trembling, under a wretched blanket in a violent fit of the ague. I bowed to him; and began by feeling his pulſe, as if I had been his firſt phyſician. The fit over, he dreſſed himſelf and ſat down to table. Algarotti, Kayſerling, Maupertuis, the king's miniſter to the States General, and myſelf, were of the party; where

Frederick. we converſed profoundly on the immortality of the ſoul, on liberty, and the androgynes of Plato."

This rigid economy, and contempt of every luxury with regard to his own perſon, was maintained by Frederick as long as he lived. The following account, taken likewiſe from Voltaire, will give an idea of his manner of living. "He roſe at five in the morning in ſummer, and ſix in winter. A lacquey came to light his fire, and dreſs and ſhave him; and indeed he almoſt wholly dreſſed himſelf. His room was not inelegant. A rich balluſtrade of ſilver, ornamented with little cupids, ſeemed to encloſe an alcove bed, the curtains of which were viſible; but behind them, inſtead of a bed, there was a library: the king ſlept on a truckle bed with a ſlight mattreſs concealed behind a ſcreen. Marcus Aurelius and Julian, thoſe apoſtles of Stoiciſm, did not ſleep in a more homely manner. At ſeven his prime miniſter arrived with a great bundle of papers under his arm. This prime miniſter was no other than a clerk who had formerly been a ſoldier and valet-de-chambre. To him the ſecretaries ſent all their diſpatches, and he brought extracts of them, to which the king wrote anſwers in two words on the margin: and thus the affairs of the whole kingdom were expedited in an hour. Towards eleven the king put on his boots, reviewed his regiment of guards in the garden, and at the ſame hour the colonels were following his example in their reſpective provinces. The princes his brothers, the general officers, and one or two chamberlains, dined at his table; which was as good as it could be in a country where there is neither game, tolerable butchers meat, nor a pullet, and where the very wheat is brought from Magdebourg. After the repaſt, he retired alone into his cabinet, where he made verſes till five or ſix o'clock. Then came a young man named D'Arget, formerly ſecretary to Valory the French envoy, who read to him. A little concert began at ſeven, in which the king played on the flute with as much ſkill as the firſt performer; and pieces of his compoſition were frequently executed. Supper was ſerved in a little hall, the ſingular and ſtriking ornament of which was a picture, the deſign of which he had given to Peſne, one of our beſt colouriſts. It was a fine picture of Priapus. Theſe repaſts were not in general the leſs philoſophic on that account. Never did men converſe in any part of the world with ſo much liberty reſpecting all the ſuperſtitions of mankind, and never were they treated with more pleaſantry and contempt. God was reſpected; but none of thoſe who had deceived men in his name were ſpared. Neither women nor prieſts ever entered the palace. In a word, Frederick lived without a court, without counſel, and without religious worſhip."

As Frederick had eſpouſed his princeſs entirely contrary to his inclination, it was imagined that on his acceſſion to the throne he would embrace the opportunity of ſetting himſelf free from engagements ſo diſagreeable to himſelf. The queen was not without ſuſpicions of this kind, inſomuch that ſhe was on the point of fainting away when he made his firſt viſit to her. To the ſurpriſe of all parties, however, he made her a very affectionate ſpeech, apologizing for his indifference, and inviting her to participate with him the throne of which ſhe was ſo worthy. In the firſt year of his reign he reſtored the academy of ſciences at Berlin which had been founded in 1700; but he ſoon became diſguſted Frederick. with its members, whom he endeavoured at all times to ridicule rather than encourage. His war with the queen of Hungary, however, which took place almoſt immediately after his acceſſion, for ſome time prevented him from taking ſuch an active part in literary matters as he was naturally inclined to do. After the peace, being at liberty to follow his inclination, he gave full ſcope to his paſſion for literature; and in the interval betwixt the concluſion of the firſt war and beginning of that of 1756, he compoſed moſt of the works which are now aſcribed to him. At this time he wrote his *Hiſtory of my own Times*, afterwards announced among his poſthumous works. In writing hiſtory he acquired a taſte for hiſtorians; and juſtly gave the preference to the ancients, the moſt celebrated of whoſe works he peruſed every year. Voltaire was his principal literary correſpondent, whom he invited to reſide with him. Afraid of loſing his liberty, however, that philoſopher heſitated, excuſed himſelf, and entered into pecuniary treaties, firſt for himſelf, and afterwards for his niece Madame Dennis, whom he wiſhed to accompany him. At laſt he was determined by ſeeing a poem from Frederick to M. d'Arnaud, in which the latter was compared to the riſing, and Voltaire to the ſetting ſun. By this Voltaire was ſo much piqued, that he ſet out for Berlin without delay, and arrived there in June 1750. He was received in the moſt magnificent and affectionate manner, and for ſome time his ſituation was very agreeable; but the diſputes and rivalſhip which took place betwixt him and Maupertuis ſoon threw every thing into confuſion. In theſe the king interfered in ſuch a manner as was certainly below his dignity; and he often exerciſed himſelf in making a jeſt of the other men of letters in a way exceedingly diſguſting, and which induced many of them to leave him. The ſquabbles with Voltaire were ſometimes very diverting; an account of ſome of which is given under the article VOLTAIRE. They ended at laſt in a final quarrel with that wit, and his departure from the kingdom. The reſtleſs diſpoſition of Frederick ſhowed itſelf after his departure, by his attempts to provoke the literati who remained at his court to quarrel with him as Voltaire had been accuſtomed to do. But they were of too paſſive a diſpoſition to gratify him in this reſpect, chooſing rather to ſuffer the moſt mortifying ſtrokes of raillery, or to leave the kingdom altogether, than to contend with him. This proved ſo uneaſy to the king, that he one day exclaimed, "Shall we have no more quarrels then?" The breaking out of the war in 1756, however, put a ſtop to this diverſion, and afforded him as many enemies as he could wiſh. The exploits he performed during the ſeven years which this unequal conteſt laſted, are almoſt incredible *; and it is amazing how the fortitude * See *Pruſſia*. and reſolution of any perſon could enable him to ſuſtain the difficulties which during this period he had to encounter. In one fatal moment, indeed, even the reſolution of Frederick was on the point of giving way. This happened after the battle of Colin, when his affairs ſeemed altogether deſperate, before they were retrieved by the victory at Roſbach. At this time he wrote to his ſiſter at Bareith, that he was on the point of putting an end to his own life; but as this reſolution did not extinguiſh in him the love of glory, he wiſhed

Frederick. wiſhed to have it ſaid that he made verſes on the brink of the grave. With this view he wrote a long poetical epiſtle to the marquis d'Argens, in which he communicated to him his deſign, and bade him farewell.

Happily, at laſt, the king's affairs took a better turn, and ſuch deſperate thoughts were laid aſide. His conſtitution, however, was irreparably injured by the exceſſive fatigues he had ſuſtained. Soon after the concluſion of the peace, his body began to bend, and his head to incline to the right ſide: by degrees he became very infirm; he was tormented with the gout, and ſubject to frequent indigeſtions. All his diſtempers, however, were born with invincible patience; and, till a very ſhort time before his death, he never ceaſed to attend his reviews, or viſit the different provinces of his dominions. He has been known to review his troops, and gallop through all the ranks, as if he felt no pain, notwithſtanding that an abſceſs which had broken out upon him, and approached to a ſuppuration, frequently, upon ſuch occaſions, touched the ſaddle. In Auguſt 1785 he impaired his health ſtill farther by aſſiſting at a review, where he was expoſed without even a cloak to a heavy rain for four or five hours. On his return to Potzdam he was ſeized with a fever; and, for the firſt time, became unable to aſſiſt at the military exerciſes of Potzdam, which take place in September. His malady, however, did not prevent him from dictating the diſpoſition of theſe exerciſes during the three days they laſted, and he always gave the word in preſence of his generals and the foreigners of diſtinction then at Potzdam. About the end of autumn the fever left him, but was ſucceeded by a violent cough; and he continued free from the gout which had uſually attacked him at this ſeaſon. He was greatly weakened by the cough, which prevented him from ſleeping; but this did not in the leaſt interrupt him in the execution of buſineſs. Every morning, at four or five o'clock, he ordered the three cabinet ſecretaries to enter his apartment, where he dictated anſwers to their papers. It was not till after the diſpatch of all his affairs that he ſaw a ſurgeon or ſometimes a phyſician, though he had a bad opinion of the phyſicians in general, whom he conſulted on his diſtemper. In the evening he amuſed himſelf from five to eight with ſome of his ſociety; and after that hour he paſſed the remainder of the time before he went to reſt, in hearing ſome ancient authors read to him; and thus he continued to employ himſelf till the very day before he died. On the 17th and 18th of May 1786, he was unable to aſſiſt at the ordinary reviews, but ſtill he hoped to be preſent at thoſe of Sileſia. He ſeveral times attempted to mount his horſe to go to the parade at Potzdam; but finding his powers inſufficient, he was obliged to return, after having proceeded a few paces. He made other attempts, but with as little ſucceſs; and at laſt his diſorder terminated in a dropſy. Being now no longer able to remain in bed, he ſat day and night in an arm chair with ſprings which could be moved at pleaſure. For near a month before his death the ſwelling of his feet gave him violent pain, ſo that he wiſhed an inciſion to be made; but the ſurgeon refuſed to perform the operation, ſuſpecting that it might haſten his death. Nature, however, accompliſhed his deſires; his right leg opened, and diſcharged ſuch a quantity of matter, that he was greatly relieved: and thoſe unacquainted with the medical art began to entertain hopes of his recovery. The phyſicians, however, were of a very different opinion; and the event juſtified their apprehenſions. On the 16th of Auguſt 1786 his throat began to rattle violently, and his attendants expected every moment that he would breathe his laſt. In this ſituation his three ſecretaries entered the room for the deſpatch of buſineſs as uſual. Even then Frederick made an effort to collect his force, giving them a ſign to wait, as if he would ſpeak with them in a ſhort time. This, however, was the laſt he could make: for he ſoon after fell into a ſtupor; though from this he recovered ſo far as to be able to ſpeak. In the evening he aſked what o'clock it was? and on being anſwered that it was nine, he ſaid, "Well then I am going to reſt." His reſpiration and voice became gradually more feeble; and he expired on Thurſday at 19 minutes after two in the morning, without any convulſion or ſymptom of pain. Frederick.

This great monarch was of the middle ſize, had large blue eyes and a piercing look. He ſpoke German incorrectly, and in a very rough manner; but talked French very fluently, and his voice was then mild and agreeable. His conſtitution was naturally feeble, but he had greatly improved it by his activity and laborious life. He had the art of relieving every one from that embarraſſment which frequently occurred in accoſting ſuch a celebrated monarch; and it ſeems probable that he himſelf conſidered on what he ſhould ſay to any illuſtrious perſon who happened to come to his court. His univerſal knowledge enabled him to converſe on all ſubjects; and thus he talked of war with military men, of verſes with the poet, of agriculture with the farmer, juriſprudence with the lawyer, commerce with the merchants, and politics with the Engliſhman. He had a very retentive memory; was fond of ſolitude and gardening; and likewiſe took great pleaſure in dogs, of which animals he conſtantly kept a number about him, giving them little balls covered with leather to play with. In company, he was fond of aſking queſtions and jeſting; in which laſt he proceeded ſuch lengths as undoubtedly were unbecoming in a ſuperior towards his inferiors, who would not have failed to reſent ſuch jokes from perſons more on an equality with them. In military affairs he was exceſſively ſevere, not to ſay cruel; of which the following anecdote may ſerve as an inſtance. In the firſt war of Sileſia, wiſhing to make ſome alterations in his camp during the night, he forbade every perſon, under pain of death, to keep, after a certain hour, a fire or other light in his tent. He himſelf went the rounds; and in paſſing the tent of a Captain Zietern he perceived a light. Entering the tent, he found the captain ſealing a letter to his wife, for whom he had a great affection. "What are you doing there? (ſays the king): Do you not know the order?" The captain fell on his knees and aſked pardon, but did not attempt to make any excuſe. "Sit down (ſays Frederick), and add a few words I am going to dictate to you." Zietern obeyed; and the king dictated, "Tomorrow I ſhall periſh on a ſcaffold." The unfortunate man wrote them, and next day was executed. In matters of domeſtic legiſlation, he was more arbitrary than juſt; of which we have a notable example in the famous

Frederick, Frederickſburg.

famous caſe of Arnold the miller. The man had refuſed to pay the rent of the mill he poſſeſſed, on pretence that the ſtream which turned it had been diverted into a fiſh pond. This was evidently a frivolous excuſe; becauſe the water which ran into the pond alſo ran out of it into the ſame channel as before, ſo that nothing could be loſt, except what evaporated from the ſurface of the fiſh pond. The judges therefore gave ſentence againſt the miller; but the king not only reverſed their ſentence, but diſgraced them. For this he was celebrated through all the newſpapers in Europe; and yet he was in the wrong, and afterwards even acknowledged himſelf to have been ſo: but, notwithſtanding he knew his error, he not only made no reparation to the parties he had injured, but allowed them to lie in priſon at Spandau all his lifetime, ſo that they were not releaſed till the commencement of the ſucceeding reign. He entertained certain and almoſt unaccountable prejudices againſt certain places and perſons, which neither conduct nor merit could eradicate. One of theſe unfortunate places was Weſtphalia, on which he never conferred any bounty: and one day a native of that country, a man of great merit, being propoſed to him for a place, he refuſed, ſaying, "He is a Weſtphalian; he is good for nothing." Voltaire accuſes him of ingratitude to the count de Seckendorf; who, as we have already ſeen, ſaved his life, and againſt whom he afterwards conceived moſt implacable hatred. His indifference towards thoſe who afforded him the moſt eſſential ſervice, was evident: when a robuſt butcher prevented him from falling, horſe and all, over a precipice, where both would have undoubtedly been killed; the king, ſenſible of the aſſiſtance that had been afforded him, turned about, and ſaying, "Thank you, friend," rode off without ever enquiring farther about the perſon who had juſt preſerved him from deſtruction

With regard to the literary merits of this monarch, we certainly cannot pronounce them extraordinary. Voltaire boaſts of having corrected his works, and others of having furniſhed him with materials for his hiſtory. He has been accuſed of borrowing whole hemiſtichs of poetry from Voltaire, Boileau, Rouſſeau, and others; nor does the charge appear to be at all void of foundation. Such of his verſes as appear to have undergone no correction, are very indifferent, nor indeed can we pronounce any of his poetic works to be of the firſt rate. In the former part of his life he entertained a great partiality for the French learning and language; but as he advanced in years, he entirely loſt this predilection, and inclined much more to favour the Engliſh and Germans. Towards the end of his life, indeed, he affected a contempt for the French, without whom it is ſaid he would ſcarcely ever have made any figure except in military affairs.

FREDERICK, is the name of two counties, and of ſeveral townſhips in America, ſuch as the county of Frederick in Maryland, which contains 30,791 inhabitants, in which are included 3641 ſlaves. It is alſo the name of a county in Virginia, 30 miles long and 20 broad, with a population of 19,681 ſouls, including 4250 ſlaves.

FREDERICKSBURG, a fort and colony of Brandenburg, on the Gold coaſt of Guinea, in Africa, near Cape Threepoints, and about 75 miles from Cape Coaſt. It mounts 46 pieces of cannon on four batteries; and formerly belonged to the Pruſſians, but is now ſubject to Denmark. W. Long. 1. 15. N. Lat. 6. 40. Frederickſburg Free ſtone.

FREDERICKSHALL, or FREDERICKSTADT, a ſtrong town of Norway, in the prefecture of Agerhuys, where Charles XII. king of Sweden was killed by a muſket ball in 1718, when he was beſieging this town. It is ſeated on the coaſt of the Categate, in E. Long. 10. 45. N. Lat. 59. 2.

FREDERICKSODE, a town of Denmark, in Jutland, taken by the Swedes in 1657, but now ſubject to Denmark. It is ſeated near the ſea, in E. Long. 99. 44. N. Lat. 55. 35.

FREDERICKSTADT, a town of Denmark, in South Jutland, built in 1621. It is ſeated on the river Eyder, in E. Long. 9. N. Lat. 54. 28.

FREDERICKSTADT, a town of Norway, in the province of Agerhuys, ſeated on a bay of the ſea, near the frontiers of Sweden, in E. Long. 11. 6. N. Lat. 59. 12.

FREE, in a general ſenſe, is uſed in oppoſition to whatever is conſtrained or neceſſitated. When applied to things endowed with underſtanding, it more peculiarly relates to the liberty of the will.

FREE Bench, ſignifies that eſtate in copyhold which the wife, being eſpouſed a virgin, has after the deceaſe of her huſband for her dower, according to the cuſtom of the manor.

In regard to this free bench, different manors have different cuſtoms: and in the manor of Eaſt and Weſt Enbourne in the county of Berks, and in other parts of England, there is a cuſtom, that when a copyhold tenant dies, the widow ſhall have her free bench in all the deceaſed huſband's lands, *dum ſola et caſta fuerit*, "while ſhe lives ſingle and chaſte;" but if ſhe is found to be guilty of incontinency, ſhe ſhall forfeit her eſtate. Nevertheleſs, upon her coming into the court of the manor riding backwards on a black ram, with his tail in her hand, rehearſing a certain form of words, the ſteward is bound by cuſtom to reſtore her to her free bench. The words are,

Here I am,
Riding on a black Ram,
Like a whore as I am;
And for my crincum crancum
Have loſt my bincum bancum,
And for my tail's game
Have done this worldly ſhame:
Therefore, pray Mr Steward, let me have my land again.

FREE or *Imperial Cities* in Germany, are thoſe not ſubject to any particular prince; but governed, like republics, by their own magiſtrates.

There were free cities (*liberæ civitates*) even under the ancient Roman empire: ſuch were thoſe to whom the emperor, by the advice or conſent of the ſenate, gave the privilege of appointing their own magiſtrates, and governing themſelves by their own laws. See CITY.

FREE Fiſhery. See *Free FISHERY*.

FREE Warren. See WARREN.

FREE Maſon. See MASON.

FREE Stone, a whitiſh ſtone, dug up in many parts of

Free ſtone || Freehold.

of Britain, which is hard and durable, and of excellent uſe in building, &c. It is a kind of the grit ſtone, but finer ſanded and ſmoothed; and is called *free*, from its being of ſuch a conſtitution as to cut freely in any direction.

The qualities of the ſeveral kinds of free ſtones uſed in the different parts of Europe are very different. They all agree in this general property indeed, that they are ſofter while in the quarry than when they have been ſome time expoſed to the air: but even this general property differs greatly in degree. There is a ſort of gray free ſtone in uſe at Paris (of which we do not yet ſeem to have met with any in this country), which has the above-mentioned quality in ſo great a degree, that the expence of working it is in a great meaſure ſaved.

This ſtone lies everywhere on the ſouth ſide of the river Seine, and is of a coarſe and large grit. It is ſo ſoft when newly taken out of the ſtrata, that they faſhion it very conveniently with a ſort of broad axe, and form as many ſtones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ſtone is as ſoft as dry clay when firſt taken up, it is found to harden ſo conſiderably in the air, that it becomes more than equal to our ordinary free ſtone.

The Portland free ſtone of Britain of the fineſt kind, which is white and of a cloſe grit, is very fit for hewing and carving; but it will neither reſiſt water nor fire, which is a very ſingular inſtance in ſo denſe a ſtone; while the free ſtone of Kent, which is leſs beautiful to the eye, and is of a grayiſh colour, and conſiderably cloſe, though of a larger grain, reſiſts the air and water very well. The freeſtone of Derbyſhire, on the other hand, is ſo brittle as to be unfit for any fine working; and ſo coarſe and open in its texture, that it lets water through: yet it bears the fire extremely well, and is fit for ovens, hearths, &c.

FREEBOOTER, or FLIBUSTER, a name given to the pirates who ſcour the American ſeas, particularly ſuch as make war againſt the Spaniards. See BUCANIER.

FREEDOM, in general, the ſtate or quality of being free. See LIBERTY.

FREEDOM of a Corporation, the right of enjoying all the privileges and immunities belonging to it. See CORPORATION.

The freedom of cities, and other corporations, is regularly obtained by ſerving an apprenticeſhip; but it is alſo purchaſed with money, and ſometimes conferred by way of compliment.

FREEDOM of Conſcience. See TOLERATION.

FREEDOM of the Will, that power or faculty of the mind, whereby it is capable of acting or not acting, chooſing or rejecting whatever it judges proper †. Of this every man muſt be ſenſible, who finds in himſelf a power to begin or forbear, continue or end ſeveral actions, barely by a thought or preference of the mind.

See *Metaphyſics.*

FREEHOLD, FRANK TENEMENT, (*liberum tenementum*), is land, or tenement, which a man holds in *fee-ſimple*, *fee-tail*, or for term of life. See FEE and TAIL.

Freehold is of two kinds, in *deed* and in *law*.

The firſt is the real poſſeſſion of land or tenement in fee, fee-tail, or for life: the other is the right a man has to ſuch land or tenement before his entry or ſeizure.

Freehold || Freezing.

A freehold, by the common law, cannot commence *in futuro*; but it muſt take effect preſently, either in poſſeſſion, reverſion, or remainder. Whatever is part of the freehold goes to the heir; and things fixed thereto may not be taken in diſtreſs for rent, or in execution, &c. No man ſhall be diſſeiſed of his freehold by ſtat. Magna Charta, cap. 29. but by judgment of his peers, or according to the laws of the land, nor ſhall any diſtrain freeholders to anſwer for their freehold in any thing concerning the ſame, without the king's writ. Freehold eſtates, of certain value, are required by ſtatutes to qualify jurors, electors of the knights of the ſhire in parliament, &c.

FREEHOLD is likewiſe extended to ſuch offices as a man holds in fee, or for life.

FREEHOLD is alſo ſometimes taken in oppoſition to villenage.

Lambard obſerves, that land, in the Saxons time, was diſtinguiſhed into *bockland*, i. e. holden by book or writing; and *folkland*, held without writing. The former, he ſays, was held on far better condition, and by the better ſort of tenants, as noblemen and gentlemen; being ſuch as we now call *freehold:* the latter was moſtly in poſſeſſion of peaſants; being the ſame with what we now call *at the will of the lord.*

In the ancient laws of Scotland, freeholders are called *milites*, "knights." In Reg. Judicial. it is expreſſed, that he who holds land upon an execution of a ſtatute merchant, until he hath ſatisfied the debt, *tenet ut liberum tenementum ſibi et aſſignatis ſuis;* and the ſame of a tenant *per elegit:* the meaning of which ſeems to be, not that ſuch tenants are freeholders, but as freeholders for the time, till they have received profits to the value of their debt.

FREETHINKER. See DEIST.

FREEZE, FRIEZA, or *Frize*, in *Commerce.* See FRIZE.

FREEZE, in *Architecture*, that part of the entablature of columns, between the architrave and corniche.

The freeze is properly a large flat face, or member, ſeparating the architrave from the corniche.

The ancients called it *zoophorus* (ζωφορος) becauſe it was uſually enriched with figures of animals; and our denomination *freeze* has a like origin, being formed of the Latin *phryxio*, "an embroiderer," becauſe it is commonly adorned with ſculptures in baſſo relievo, imitating embroidery.

FREEZING, in *Philoſophy*, the ſame with congelation. See FREEZING, CHEMISTRY *Index*, and SALTS.

FREEZING Rain, or *Raining Ice*, a very uncommon kind of ſhower, which fell in the weſt of England, in December 1672; whereof we have divers accounts in the Philoſophical Tranſactions.

This rain, as ſoon as it touched any thing above ground, as a bough or the like, immediately ſettled into ice, and by multiplying and enlarging the icicles, broke all down with its weight. The rain that fell on the ſnow immediately froze into ice, without ſinking in the ſnow at all.

It made an incredible deſtruction of trees, beyond any thing in all hiſtory. "Had it concluded with ſome guſt of wind (ſays a gentleman on the ſpot), it

Freezing ‖ French.

might have been of terrible conſequence. I weighed the ſprig of an aſh tree, of juſt three quarters of a pound; the ice on which weighed 16 pounds. Some were frighted with the noiſe in the air; till they diſcerned it was the clatter of icy boughs, daſhed againſt each other." Dr Beale obſerves, that there was no conſiderable froſt obſerved on the ground during the whole; whence he concludes, that a froſt may be very intenſe and dangerous on the tops of ſome hills and plains, while in other places it keeps at two, three, or four feet diſtance above the ground, rivers, lakes, &c. and may wander about furious in ſome places and remiſs in others not far off. The froſt was followed by glowing heats, and a wonderful forwardneſs of flowers and fruits.

FREIGHT, in *Navigation* and *Commerce*, the hire of a ſhip, or a part thereof, for the conveyance and carriage of goods from one port or place to another; or the ſum agreed on between the owner and the merchant, for the hire and uſe of a veſſel. See *Maritime Laws*.

FREIND, John, a moſt learned Engliſh phyſician and writer of the 18th century, was born at Croton, Northamptonſhire, in 1675. In 1696, he publiſhed, in conjunction with Mr P. Foulkes, an edition of two Greek orations, one of Æſchines againſt Cteſiphon, and the other of Demoſthenes *de Corona*, with a new Latin verſion. In 1699, he wrote a letter to Dr Solane concerning an *Hydrocephalus*, publiſhed in the Philoſophical Tranſactions; and another letter in Latin to the ſame gentleman, *De ſpaſmis rarior. hiſtoria*, printed in the ſame Tranſactions. In 1703, his *Emmenalogia* appeared, which gained him great reputation. In 1704, he was choſen profeſſor of chemiſtry in the univerſity of Oxford. In 1705 he attended the earl of Peterborough to Spain, as phyſician to the army there; and, upon his return in 1707, publiſhed an account of the earl's expedition and conduct. In 1709 he publiſhed his Chemical Lectures. In 1712 he attended the duke of Ormond in Flanders, as his phyſician. In 1716 he was admitted a fellow of the College of Phyſicians in London. This year he publiſhed the firſt and third books of Hippocrates *De morbis popularibus*, with a Commentary on Fevers, written by himſelf. He ſat member for the borough of Launceſton in Cornwall in 1722, where he diſtinguiſhed himſelf by his oppoſition to the adminiſtration. March 1722, he was committed to the Tower on a charge of high treaſon; and while he was under confinement, he wrote a Latin epiſtle to Dr Mead, *de quibuſdam variolarum generibus*; and began his Hiſtory of Phyſic, the firſt part of which was publiſhed in 1725, and the ſecond in 1726. Upon the acceſſion of George II. to the throne, he was appointed phyſician in ordinary to the queen, who ſhowed the utmoſt regard and eſteem for him. He died at London in 1728. His works were publiſhed together in Latin at London, 1733, in folio, and dedicated to the queen.

FREITS. See Freats.

FRENCH, in general, ſomething belonging to France: thus we ſay, the French language, French cuſtom, polity, &c.

The French language, as it now ſtands, is no original or mother language, but a medley of ſeveral. Thoſe that prevail moſt, and which are, as it were, the baſis thereof are, 1. The Celtic; whether that were a particular language itſelf, or whether it were only a dialect of the Gothic, as ſpoke in the weſt and north. 2. The Latin, which the Romans carried with them into Gaul, when they made the conqueſt thereof. And, 3. The Teutonic, or that dialect of the Teutonic ſpoke by the Franks, when they paſſed the Rhine, and eſtabliſhed themſelves in Gaul. Of theſe three languages, in the ſpace of about thirteen hundred years was the preſent French formed, ſuch as it is now found. Its progreſs was very ſlow; and both the Italian and Spaniſh were regular languages long before the French. French.

Paſquier obſerves, it was under Philip de Valois that the French tongue firſt began to be poliſhed; and that, in the regiſter of the chamber of accounts of that time, there is a purity ſeen almoſt equal to that of the preſent age. However, the French was ſtill a very imperfect language till the reign of Francis I.: the cuſtom of ſpeaking Latin at the bar, and of writing the public acts and inſtruments of the courts of juſtice in that language, had made them overlook the French, their own language. Add that the preceding ages had been remarkable for their ignorance, which was owing, in a good meaſure, to the long and calamitous wars which France had been engaged in; whence the French nobleſſe deemed it a kind of merit not to know any thing; and the generals regarded little whether or not they wrote and talked politely, provided they could but fight well.

But Francis I. who was the reſtorer of learning, and the father of the learned, changed the face of things; and after his time, Henry Stevens printed his book, *De la Precellence du Langage François*. The change had become very conſpicuous at the end of the 16th century; and under Henry IV. Amyot, Coeffeteau, and Malherbe, contributed towards bringing it to its perfection; which the Cardinal de Richelieu completed, by the eſtabliſhment of the French academy; an aſſembly, wherein the moſt diſtinguiſhed perſons of the church, the ſword, and the gown, have been members. Nor did the long reign of Louis XIV. contribute a little to the improvement of the language; the perſonal qualities of that prince, and his taſte for the fine arts, and that of the princes of the blood, rendered his court the politeſt in Europe. Wit and magnificence ſeemed to vie; and his generals might have diſputed with the Greeks, Romans, &c. the glory of writing well, if they could not that of fighting. From court, the elegance and purity of the language ſoon ſpread itſelf into the provinces; and now there is ſcarce anybody there who does not write and ſpeak good French.

One of the characters of the French language is, to be natural and eaſy. The words are ranged in it much in the ſame order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inverſion of the natural order of words is reputed a beauty. Indeed the Hebrew ſurpaſſes even the French in this point; but then it comes ſhort of it in copiouſneſs and variety.

It muſt be added, however, that as to the analogy of grammar, and the ſimplicity wherewith the moods of verbs are formed, the Engliſh has the advantage not only over the French, but over all the known languages

in

French, Freſcati.

in the world; but then the turns, the expreſſions, and the idioms of the Engliſh, are ſometimes ſo quaint and extraordinary, that it loſes a good deal of the advantage which its grammatical ſimplicity gives it over the reſt.

The French has but few compound words; wherein it differs widely from the Greek, High Dutch, and Engliſh. This the French authors own a great diſadvantage in their language; the Greek and Dutch deriving a great part of their force and energy from the compoſition of words, and frequently expreſſing that in one ſounding word, which the French cannot expreſs but by a periphraſis. The diminutives in the French are as few as the compounds; the greateſt part of thoſe remaining in uſe having loſt their diminutive ſignification; but what diſtinguiſh the French moſt, are its juſtneſs, purity, accuracy, and flexibility.

French is the moſt univerſal and extenſive language in Europe. The policy of ſtates and courts has rendered it neceſſary for the miniſters of princes, and their officers, &c. and the taſte of arts and ſciences has had the ſame effect with regard to the learned. In Germany, and elſewhere, the princeſſes and perſons of diſtinction value themſelves on underſtanding French; and in ſeveral courts of Europe, French is almoſt as much known as the language of the country.

FRESCATI, or FRASCATI, a ſmall town, ſituated on the brow of a hill, about twelve miles to the eaſtward of Rome. It derives its name from the coolneſs of the air, and *freſh* verdure of the fields around. It is built of the ruins of the ancient Tuſculum; and the Tuſculan villa where Cicero wrote his famous queſtions is at a place now called *Grotta Ferrata*, about two miles diſtant. E. Long. 11. 43. N. Lat. 41. 48. There is a very fine proſpect from this town into the neighbouring country, which abounds with the ſeats of cardinals and other nobility. It is the ſee of a biſhop, who is one of the ſix ſenior cardinals, and is ſurrounded by ſome of the moſt beautiful villas in Italy; the principal of which are the villa Aldobrandini, belonging to Prince Pamfili; the villa Taberna, belonging to Prince Borgheſe; and villa Ludoviſi, to the family of Colonna. The villa Aldobrandini, called alſo *Belvedere* from its beautiful proſpect, is the moſt remarkable, on account of its fine ſituation, extenſive gardens, airy terraces, its grottoes, caſcades, and water-works. Over a ſaloon, near the grand caſcade, is the following inſcription:

Huc ego migravi muſis comitatus Apollo;
Hic Delphi, hic Helicon, hic mihi Delos erit.

The walls are adorned with a repreſentation of Apollo and the Muſes; and ſome of that god's adventures are painted in freſco by Domenichino. The villa Taberna is one of the fineſt and beſt furniſhed of any in the neighbourhood of Rome. From this you aſcend through gardens to Monte Dracone, another palace on a more lofty ſituation, belonging alſo to that prince, and deriving its name from the arms of his family. From hence you may ſee Rome, and the whole extent of the plain; it has a noble aſcent, with a broad paved walk; and among other curioſities there is a hall adorned with the pictures of a vaſt number of men eminent for learning and arms. The gardens, laid out by Vignola, contain three miles in compaſs; and have many delightful walks and curious water-works. Near this place are the monks of Camaldoli and the capuchins; and higher up are ruins of the ancient Tuſculum. Aſcending towards the plain, two miles on the right hand, you find the famous abbey of Grotta Ferrata, belonging to the monks of St Baſil, and ſituated on the ruins of Cicero's houſe. The Virgin Mary of the great altar is an ancient Greek picture; in the chapel the pictures of St Nilus and St Bartholomew the abbot, are by Annibal Caracci; and all the paintings in freſco of this chapel are by Domenichino. Villa Ludoviſi has a charming walk going up to it, where you ſee the ruins of Lucullus's palace. The houſe is ſmall; but the gardens are large, embelliſhed with a great variety of walks and fountains, and a beautiful caſcade.

Freſcati, Freſco.

FRESCO, a method of painting in relievo on walls, ſo as to endure the weather. It is performed with water-colours on freſh plaſter, or on a wall laid with mortar not yet dry. This ſort of painting has a great advantage by its incorporating with the mortar; and drying along with it, becomes very durable. The Italians, from whom we borrow the term, call it *freſco*; becauſe it is frequently uſed for walls, alcoves, and other buildings in the *open air*. Vitruvius, lib. vii. cap. 4. calls it *udo tectorio*.

Painting in freſco is very ancient, having been practiſed in the earlieſt ages of Greece and Rome. It is chiefly performed on walls and vaults, newly plaſtered with lime and ſand; but the plaſter is only to be laid, in proportion as the painting goes on; no more being to be done at once than the painter can deſpatch in a day, while it dries. Before he begins to paint, a cartoon or deſign is uſually made on paper, to be chalked, and transferred to the wall, about half an hour after the plaſter is applied.

The ancients painted on ſtucco; and we may remark in Vitruvius what infinite care they took in making the incruſtation or plaſtering of their buildings to render them beautiful and laſting; though the modern painters find a plaſter of lime and ſand preferable to it; both as it does not dry ſo haſtily, and as being a little browniſh, it is fitter to lay colours on, than a ground ſo white as ſtucco.

In this kind of painting, all the compound and artificial colours, and almoſt all the minerals are ſet aſide, and ſcarce any thing is uſed but earths; which are capable of preſerving their colour, defending it from the burning of the lime, and reſiſting its ſalt, which Vitruvius calls its bitterneſs.

For the work to come out in all its beauty, the colours muſt be laid on quick, while the plaſter is yet moiſt; nor ſhould they ever be retouched dry, with colours mixed up with the white of an egg, or ſize, or gum, as ſome workmen do; becauſe ſuch colours grow blackiſh; nor do any preſerve themſelves, but only ſuch as were laid on haſtily at firſt.

The colours uſed are white made of lime ſlaked long before, and white marble duſt; ochre, both red and yellow; verditer; lapis lazuli; ſmalt; black chalk, &c. All which are only ground, and worked up with water; and moſt of them grow brighter and brighter as the freſco dries.

The bruſhes and pencils for this work ought to be

Fresco || Fret.

long and soft, otherwise they will rake and raise the painting. The colours should be full, and flowing from the brush; and the design perfect: for in this work you cannot alter or add upon any colour.

FRESH WATER, is that not tinctured or impregnated with salt or saline particles enough to be discovered by the sense. Such generally is that of springs, rains, wells, lakes, &c.

The dulcifying or making of salt water fresh is a secret that has been long sought with great attention. For an account of the principal attempts that have been made with this view. See *Sea WATER*.

Fresh WIND signifies strong, but not violent; hence when the gale increases, it is said to freshen.

FRESHES, in sea language, denotes the impetuosity of an ebb tide, increased by heavy rains, and flowing out into the sea, often discolouring it to a considerable distance, and forming a line that separates the two colours, and which may be distinctly perceived for a great length along the coast.

FRESHES, a local term signifying annual inundations, from the river being swollen by the melted snows and other fresh waters from the uplands, as is the Nile, &c. from periodical or tropical rains. As a sailor's term, it is opposed to marine or salt water floodings, tides, &c. The word is of common use in America, where the inundations so called are of great service. They bring down the soil to the intervals below, and form a fine mould, producing corn, grain, and herbage, in the most luxuriant plenty. They also afford another benefit, in regard to many rivers in America, viz. in equalizing the surface of the stream (where rapid falls, or cascades, obstruct the navigation), so that rafts of timber and other gross produce are then floated down to the sea ports in great quantities.

FRESNOY, CHARLES ALPHONSE DU, an excellent poet and painter, was born at Paris in 1611. He was instructed there by Perrier and Simon Vouet in painting: but he did not long adhere to Vouet's manner of colouring; for as soon as he fixed himself at Rome, he made the works of Titian the models for his imitation. He was, however, more celebrated as a poet than as a painter; and gave more attention to the theory than to the practice of the pencil. Accordingly he is better known by his incomparable poem *De arte graphica*, than by his performances on the canvas: and on this poem he bestowed so much pains, that he died in 1665, before it was published. It was printed afterwards with a French prose translation and notes by M. de Piles; and was translated into English by Mr Dryden, who prefixed to it an original preface containing a parallel between painting and poetry.

FRET, or FRETTE, in *Architecture*, a kind of knot or ornament, consisting of two lists or small fillets variously interlaced or interwoven, and running at parallel distances equal to their breadth.

FRET, in *Heraldry*, a bearing composed of six bars, crossed and variously interlaced. Some call it the *true-lover's knot*. See HERALDRY.

FRET, in *Music*, signifies a kind of stop on some instruments, particularly bass viols and lutes. Frets consist of strings tied round the neck of the instrument, at certain distances, within which such and such notes are to be found.

FRET-Work, that adorned with frets. It is sometimes used to fill up and enrich flat empty spaces; but it is mostly practised in roofs, which are fretted over with plaster work. Fret || Friburg.

FRETTS, in *Mineralogy*, a term used by our miners to express the worn side of the banks of the rivers in mine countries, where they search for the shoad stones or grewts washed down from the hills, in order from thence to trace out the running of the shoad up to the mine.

FRETTS, *Freats*, or *Freits*. See FREATS.

FREYBERG, or FRIEDBERG, a town in the circle of Upper Saxony, containing upwards of 60,000 people. There are mines of copper, tin, lead, and silver, in its vicinity, which afford employment to a considerable number of workmen, and produce an annual revenue of more than 10,000 rix-dollars. The princes of the house of Saxony are usually buried here, where there is also an academy for the study of mineralogy, instituted in the year 1765, and reckoned the most famous for that science of any in Germany. It is situated on a branch of the Muldau, 19 miles south-west of Dresden, in N. Lat. 51. and W. Long. 13. 18.

FRIABLE, among naturalists, an appellation given to bodies that are easily crumbled to pieces: such are pumice and all calcined stones.

FRIAR, or FRIER, by the Latins called *frater*, the Italians *fra*, and the French *frere*, that is, *brother*: a term common to the monks of all orders; founded on this, that there is a kind of fraternity or brotherhood presumed between the several religious persons of the same convent or monastery.

Friars are generally distinguished into these four principal branches, viz. 1. Minors, Gray friars, or Franciscans. 2. Augustines. 3. Dominicans, or Black friars. 4. White friars or Carmelites. From these four the rest of the orders descend. See FRANCISCANS, AUGUSTINES, &c.

FRIAR, in a more peculiar sense, is restrained to such monks as are not priests; for those in orders are usually dignified with the appellation of *father*.

FRIARS Observant (*fratres observantes*), were a branch of the Franciscans; thus called, because not combined together in any cloister convent, or corporation, as the conventuals are; but only agreed among themselves to observe the rules of their order, and that more strictly than the conventuals did, from whom they separated themselves out of a singularity of zeal, living in certain places of their own choosing.

FRIBURG, a large town of Germany, and capital of Brisgaw; remarkable for the steeple of the great church, which, next to that of Strasburg, is the finest in Germany; and for its university. The inhabitants are famous for polishing crystal and precious stones. It has been several times taken and retaken; particularly by the French in 1744, who demolished the fortifications. It was also taken by them in June 1796. It is seated on the river Triset, ten miles east of Brisach, and 26 south of Strasburgh. E. Long. 7. 57. N. Lat. 48. 4.

FRIBURG, a town of Swisserland, and capital of the canton of the same name, seated on the river Sane, in E. Long. 6. 48. N. Lat. 46. 50. Its situation is most singular and picturesque: "It stands partly in a small plain, partly on bold acclivities on a ridge *Cox's Travels in Switzerland.*

Friburg, Fricaſſee. ridge of rugged rocks, half encircled by the river Sane; and is ſo entirely concealed by the circumjacent hills, that the traveller ſcarcely catches the ſmalleſt glimpſe, until he burſts upon a view of the whole town from the overhanging eminence. The fortifications, which conſiſt of high ſtone walls and towers, encloſe a circumference of about four miles, within which ſpace the eye comprehends a ſingular mixture of houſes, rocks, thickets, and meadows, varying inſtantly from wild to agreeable, from the buſtle of a town to the ſolitude of the deepeſt retirement. The Sane winds in ſuch a ſerpentine manner as to form in its courſe, within the ſpace of two miles, five obtuſe angles, between which the intervening parts of the current are parallel to each other. On all ſides the deſcent to the town is extremely ſteep: in one place the ſtreets even paſs over the roofs of the houſes. Many of the edifices are raiſed in regular gradation like the ſeats of an amphitheatre; and many overhang the edge of a precipice in ſuch a manner, that on looking down, a weak head would be apt to turn giddy. But the moſt extraordinary point of view is from the Pont-neuf. To the north-weſt, part of the town ſtands boldly on the ſides and the piked back of an abrupt ridge; and from eaſt to weſt a ſemicircle of high perpendicular rocks is ſeen, whoſe baſe is waſhed and undermined by the winding Sane, and whoſe tops and ſides are thinly ſcattered with ſhrubs and underwood. On the higheſt point of the rocks, and on the very edge of the precipice, appears, half hanging in the air, the gate of the town called *Bourguillon:* a ſtranger ſtanding on the bridge would compare it to Laputa, or the Flying iſland in Gulliver's Travels; and would not conceive it to be acceſſible but by means of a cord and pulleys. The houſes, conſtructed with a gray ſand ſtone, are neat and well built; and the public edifices, particularly the cathedral, are extremely elegant. The inhabitants are Roman Catholics, as are thoſe of the whole canton. The biſhop of Lauſanne, called here the biſhop of Friburg, reſides in this city. He is appointed by the pope, uſually at the recommendation of the French court: and his revenues, including a ſmall penſion from France, and from the abbey of Hauterive, of which he was abbot, amount to about 400l. per annum. His dioceſe extends over the whole canton, and part of that of Soleure. In all his acts and deeds he ſigns himſelf biſhop and count of Lauſanne, and prince of the German empire. The ſovereign power reſides in the great council of two hundred; compriſing the two advoyers, the chancellor, the grand ſautier, the ſenate or little council of twenty-four, the ſixty, from which body are choſen the bannerets and principal magiſtrates, and the remaining hundred and twelve members, who are ſimply denominated burghers."

FRIBURG, *the Canton of*, one of the 13 republics of Switzerland. It is ſurrounded on all ſides by the canton of Bern. The land is fertile in corn, fruits, and paſtures; and it is ſaid the canton can ſend 18,000 men into the field. This canton is entirely Catholic.

FRICASSEE, a diſh or meſs haſtily dreſſed in a frying pan, and ſeaſoned with butter, oil, or the like. The word is French, formed of the Latin *friſatura*, "frying." Others will have fricaſſee formed in imitation of the noiſe made by butter, or other fat, when melted in the pan. We ſay a fricaſſee of pullets, of rabbits, of tench, of tripe, of frogs, of eggs, of peas, &c. Fricaſſee ‖ Friction.

FRICENTI, an epiſcopal town of Italy, in the kingdom of Naples, and in the farther principato, near the river Tripalto, in E. Long. 15. 2. N. Lat. 40. 59.

FRICTION, the act of rubbing or grating the ſurface of one body againſt that of another, called alſo *attrition*. The phenomena ariſing upon the friction of divers bodies, under different circumſtances, are very numerous and conſiderable. Mr Hawkſbee gives us a number of experiments of this kind; particularly of the attrition or friction of glaſs, under various circumſtances, the reſult of which was, that it yielded light and became electrical. All bodies by friction produce heat; many of them emit light; particularly a cat's back, ſugar, beaten ſulphur, mercury, ſea water, gold, copper, &c. but, above all, diamonds, which, when briſkly rubbed againſt glaſs, gold, or the like, yield a light equal to that of a live coal when blowed by the bellows See ELECTRICS and ELECTRICITY.

FRICTION, in *Mechanics*, denotes the reſiſtance a moving body meets with from the ſurface on which it moves. Friction ariſes from the roughneſs or aſperity of the ſurface of the body moved on, and that of the body moving: for ſuch ſurfaces conſiſting alternately of eminences and cavities, either the eminences of the one muſt be raiſed over thoſe of the other, or they muſt be both broke and worn off: but neither can happen without motion, nor can motion be produced without a force impreſſed. Hence, the force applied to move the body is either wholly or partly ſpent on this effect: and conſequently there ariſes a reſiſtance or friction, which will be greater, *cæteris paribus*, as the eminences are the greater and the ſubſtance the harder: and as the body, by continual friction, becomes more and more poliſhed, the friction diminiſhes. See MECHANICS.

FRICTION, in *Medicine* and *Surgery*, denotes the act of rubbing a diſeaſed part with oils, unguents, or other matters, in order to eaſe, relieve, and cure it. Frictions are much uſed of late in venereal caſes. They prefer the applying of mercury externally by way of friction, to that of giving it internally, to raiſe a ſalivation.

There are alſo frictions with the fleſh bruſh, a linen cloth, or the hand only. Theſe frictions are a ſort of exerciſe which contributes greatly to health; as they excite and ſtir up the natural warmth, divert defluxions, promote perſpiration, open the pores of the ſkin, and carry off ſtagnant humours.

The fleſh bruſh (Dr Cheyne obſerves) is an exerciſe extremely uſeful for promoting a full and free perſpiration and circulation. Every body knows the effect of currying horſes; that it makes them ſleek, gay, lively, and active; ſo as even to be judged equivalent to half the feeding. This it can no otherwiſe effect, but by aſſiſting nature to throw off the recrements of the juices, which ſtop the free circulation, and, by conſtant friction, irritation, and ſtimulation, to bring the blood and ſpirits to the parts moſt diſtant from the ſeat of heat and motion; and ſo plump up the ſuperficial muſcles. And the ſame effect it would have in other creatures, and man himſelf, if managed in the ſame manner, and with the ſame care and regularity.

Perſons,

Friction || Friendly Iſlands.

Perſons, therefore, of weak nerves and ſedentary lives, would do well to ſupply the want of other exerciſe with ſpending half an hour, morning and night, in currying and rubbing their whole body, eſpecially their limbs, with a fleſh bruſh. But this means of health is moſt advantageouſly uſed when the *primæ viæ* are moſt empty.

FRIDAY, the ſixth day of the week; ſo named of *Freya*, a Saxon deity. By the Romans it was called *dies Veneris*. See FREA.

Good-FRIDAY. See *GOOD-Friday*.

FRIDSTOL, mentioned, in our ancient writers, among the immunities granted to churches, ſignifies a ſeat, chair, or place of peace and ſecurity, where criminals might find ſafety and protection: of theſe there were many in England; but the moſt famous were that at Beverly, and that in St Peter's church at York, granted by charter of King Henry I.

FRIEDENSHUETTEN, a Moravian ſettlement whoſe name ſignifies *tents of peace*, ſituated on the Suſquehannah river in Pennſylvania, about 24 miles below Tioga point, which owed its origin to the united brethren, in the year 1765. At that period it contained 13 huts belonging to the Indians, beſides 40 houſes conſtructed after the European manner, and a very neat chapel.

FRIENDLY ISLANDS, a cluſter of iſlands in the Pacific ocean, ſo named by Captain Cook in the year 1773, on account of the friendſhip which appeared to ſubſiſt among the inhabitants, and from their courteous behaviour to ſtrangers. Abel Janſen Taſman, an eminent Dutch navigator, firſt touched here in 1643, and gave names to the principal iſlands. Captain Cook laboriouſly explored the whole cluſter, which he found to conſiſt of more than 60. The three iſlands which Taſman ſaw he named *New Amſterdam*, *Rotterdam*, and *Middleburgh*. The firſt is the largeſt, and extends about 21 miles from eaſt to weſt, and about 13 from north to ſouth. Theſe iſlands are inhabited by a race of Indians, who cultivate the earth with great induſtry. The iſland of Amſterdam is interſected by a ſtraight and pleaſant road with fruit trees on each ſide, which provide ſhade from the ſcorching heat of the ſun. The chief iſlands are Annamooka, Tongataboo (the reſidence of the ſovereign and the chiefs), Lefooga, and Eooa. Lefooga is about ſeven miles long, and in ſome places not above two or three broad. It is in many reſpects ſuperior to Annamooka. The plantations are both more numerous and more extenſive; and encloſed by fences which, running parallel to each other, form fine ſpacious public roads, which would appear beautiful in countries where rural conveniences have been carried to the greateſt perfection. They are, in general, highly cultivated, and well ſtocked with the ſeveral roots and fruits which theſe iſlands produce; and Captain Cook endeavoured to add to their number by planting Indian corn, and the ſeeds of melons, pumpkins, and the like. Eooa, when viewed from the ſhip at anchor, formed one of the moſt beautiful proſpects in nature, and very different from the others of the Friendly Iſles; which being low, and perfectly level, exhibit nothing to the eye but the trees which cover them: whereas here, the land riſing gently to a conſiderable height, preſents us with an extenſive proſpect, where groves of trees are only interſperſed at irregular diſtances, in beautiful diſorder, and all the reſt is covered with graſs, except near the ſhores where it is entirely covered with fruit and other trees; amongſt which are the habitations of the natives. In order to have a view of as great a part of the iſland as poſſible, Captain Cook and ſome of his officers walked up to the higheſt point of the iſland. From this place they had a view of almoſt the whole iſland, which conſiſted of beautiful meadows of prodigious extent, adorned with tufts of trees, and intermixed with plantations. 'While I was ſurveying this delightful proſpect (ſays Captain Cook), I could not help flattering myſelf with the pleaſing idea that ſome future navigator may, from the ſame ſtation, behold theſe meadows ſtocked with cattle, brought to theſe iſlands by the ſhips of England; and that the completion of this ſingle benevolent purpoſe, independent of all other conſiderations, would ſufficiently mark to poſterity, that our voyages had not been uſeleſs to the general intereſts of humanity. 'The next morning,' ſays our benevolent commander, 'I planted a pine apple, and ſowed the ſeeds of melons and other vegetables in Taoofa's plantation. I had indeed ſome encouragement to flatter myſelf that my endeavours of this kind alſo would not be fruitleſs; as I had this day a diſh of turnips ſerved up at my dinner, which was the produce of ſeeds I left here in my former voyage.'

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The natives of theſe iſlands ſeldom exceed the common ſtature; but are very ſtrong and well made, eſpecially as to their limbs. They are generally broad about the ſhoulders; and though the muſcular diſpoſition of the men, which ſeems a conſequence of much action, rather conveys the appearance of ſtrength than of beauty, there are ſeveral to be ſeen who are really handſome. The women are not ſo much diſtinguiſhed from the men by their features as by their general form, which is for the moſt part deſtitute of that ſtrong fleſhy firmneſs that appears in the latter. The features of ſome are ſo delicate, as not only to be a true index of their ſex, but to lay claim to a conſiderable ſhare of beauty and expreſſion: for the bodies and limbs of moſt of the females are well proportioned; and ſome abſolutely perfect models of a beautiful figure. But the moſt remarkable diſtinction in the women is the uncommon ſmallneſs and delicacy of their fingers, which may be put in competition with the fineſt in Europe. The general colour is a caſt deeper than the copper brown; but ſeveral of the men and women have a true olive complexion; and ſome of the laſt are even a great deal fairer. Their countenances very remarkably expreſs the abundant mildneſs or good nature which they poſſeſs; and are entirely free from that ſavage keenneſs which marks nations in a barbarous ſtate. They are frank, cheerful, and good-natured.

There are, upon the whole, few natural defects or deformities to be found among theſe people. The moſt common is the tetter or ring worm, that ſeems to affect almoſt one half of them, and leaves whitiſh ſerpentine marks everywhere behind it; but this is of leſs conſequence than another which is very frequent, and appears on every part of the body. Captain Cook had the mortification to learn that all the care he took when he firſt viſited theſe iſlands, to prevent the venereal diſeaſe from being communicated to the inhabi-

tants,

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tants, had proved ineffectual. What is extraordinary, they do not ſeem to regard it much; and as there appeared few ſigns of its deſtroying effects, probably the climate, and the way of living of theſe people, greatly abated its virulence. There are two other complaints frequent amongſt them; one of which is an indolent firm ſwelling, that affects the legs and arms, and increaſes them to an extraordinary ſize in their whole length. The other is a tumor of the ſame ſort in the teſtieles, which ſometimes exceeds the ſize of the two fiſts. But in other reſpects they may be conſidered as uncommonly healthy.

Their hair is in general ſtraight, thick, and ſtrong, though a few have it buſhy or frizzled. The natural colour is black; but the greateſt part of the men, and ſome of the women, have it ſtained of a brown or purple colour, and a few of an orange caſt. They wear it variouſly cut. Some have it cut off on one ſide of the head only; others have it entirely cut off except a ſingle lock; the women in general wear it ſhort. The men have their beards cut ſhort; and both men and women ſtrip the hair from the armpits. The men are ſtained from about the middle of the belly to about half way down the thighs with a deep blue colour. The women have only a few ſmall lines or ſpots thus imprinted on the inſide of their hands. Their kings, as a mark of diſtinction, are exempted from this cuſtom.

The men are all circumciſed, or rather ſuperciſed, as the operation conſiſts in cutting off only a ſmall piece of the foreſkin at the upper part: which by that means is rendered incapable ever after of covering the glans. This is all they aim at, as they ſay the operation is practiſed from a notion of cleanlineſs.

The dreſs of both men and women is the ſame: and conſiſts of a piece of cloth or matting (but moſtly the former) about two yards wide and two and a half long: at leaſt ſo long as to go once and a half round the waiſt, to which it is confined by a girdle or cord. It is double before, and hangs down like a petticoat, as low as the middle of the leg. The upper part of the garment above the girdle is plaited into ſeveral folds; ſo that, when unfolded, there is cloth ſufficient to draw up and wrap round the ſhoulders; which is very ſeldom done. The inferior ſort are ſatisfied with ſmall pieces; and very often wear nothing but a covering made of leaves of plants, or the maro, which is a narrow piece of cloth or matting like a ſaſh. This they paſs between the thighs and wrap round the waiſt; but the uſe of it is chiefly confined to the men. The ornaments worn by both ſexes are necklaces, made of the fruit of the pandanus, and various ſweet ſmelling flowers, which go under the general name of *kahulla*. Others are compoſed of ſmall ſhells, the wing and leg-bones of birds, ſharks-teeth, and other things; all which hang looſe upon the breaſt; rings of tortoiſe ſhell on the fingers; and a number of theſe joined together as bracelets on the wriſts. The lobes of the ears (though moſt frequently only one), are ſometimes perforated with two holes, in which they wear cylindrical bits of ivory about three inches long.

Cleanlineſs induces them to bathe in the ponds, which ſeem to ſerve for no other purpoſe. They are ſenſible that ſalt water hurts their ſkin; and when neceſſity obliges them to bathe in the ſea, they commonly have ſome cocoa nut ſhells filled with freſh water poured over them to waſh it off. People of ſuperior rank uſe cocoa nut oil, which improves the appearance of the ſkin very much. Friendly Islands.

The employment of the women is of the eaſy kind, and, for the moſt part, ſuch as may be executed in the houſe. The manufacturing their cloth is wholly conſigned to their care; as is alſo that of their mats, which are eſteemed both for their texture and their beauty. There are many other articles of leſs note that employ the ſpare time of their females; as combs, of which they make vaſt numbers, and little baſkets with ſmall beads; but all finiſhed with ſuch neatneſs and taſte in the diſpoſition of the various parts, that a ſtranger cannot help admiring their aſſiduity and dexterity.

The province allotted to the men, as might be expected, is far more laborious and extenſive than that of the women. Agriculture, architecture, boat building, fiſhing, and other things that relate to navigation, are the objects of their care. Cultivated roots and fruits being their principal ſupport, this requires their conſtant attention to agriculture, which they purſue very diligently, and ſeem to have brought almoſt to as great perfection as circumſtances will permit. In planting the plantains and yams, they obſerve ſo much exactneſs, that, which ever way you look, the rows preſent themſelves regular and complete. The cocoa nut and bread fruit trees are ſcattered about without any order, and ſeem to give them no trouble after they have attained a certain height.

The houſes of the lower people are poor huts, and very ſmall; thoſe of the better ſort are larger and more comfortable. The dimenſions of one of a middling ſize are about 30 feet long, 20 broad, and 12 high. Their houſe is, properly ſpeaking, a thatched roof or ſhed, ſupported by poſts and rafters, diſpoſed in a very judicious manner. The floor is raiſed with earth ſmoothed, and covered with ſtrong thick matting, and kept very clean. A thick ſtrong mat, about two and a half or three feet broad, bent into the form of a ſemicircle, and ſet upon its edge, with the ends touching the ſide of the houſe, in ſhape reſembling the fender of a fire hearth, encloſes a ſpace for the maſter and miſtreſs of the family to ſleep in. The reſt of the family ſleep upon the floor, wherever they pleaſe to lie down; the unmarried men and women apart from each other: Or if the family be large, there are ſmall huts adjoining, to which the ſervants retire in the night; ſo that privacy is as much obſerved here as one could expect. The clothes that they wear in the day ſerve for their covering in the night. Their whole furniture conſiſts of a bowl or two, in which they make kava; a few gourds; cocoa nut ſhells; and ſome ſmall wooden ſtools, which ſerve them for pillows.

They diſplay much ingenuity in the building of their canoes, as well as in the navigating them.

The only tools which they uſe to conſtruct them, which are very dexterouſly made, are hatchets, or rather thick adzes, of a ſmooth black ſtone that abounds at Toofoa; augres, made of ſharks teeth, fixed on ſmall handles, and raſps of a rough ſkin of a fiſh, faſtened on flat pieces of wood, thinner on one ſide, which alſo have handles. The cordage is made from the fibres of the cocoa nut huſk, which, though not more than nine or ten inches long, they plait, about the ſize of

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a quill, or leſs, to any length that they pleaſe, and roll it up in balls, from which the larger ropes are made by twiſting ſeveral of theſe together. The lines that they fiſh with are as ſtrong and even as the beſt cord we make, reſembling it almoſt in every reſpect. Their other fiſhing implements are large and ſmall hooks made of pearl ſhell. Their weapons are clubs of different ſorts, (in the ornamenting of which they ſpend much time), ſpears and darts. They have alſo bows and arrows; but theſe ſeemed to be deſigned only for amuſement, ſuch as ſhooting at birds, and not for military purpoſes. The ſtools are about two feet long, but only four or five inches high, and near four broad, bending downward in the middle, with four ſtrong legs, and circular feet; the whole made of one piece of black or brown wood, neatly poliſhed, and ſometimes inlaid with bits of ivory.

Yams, plantains, and cocoa nuts, compoſed the greateſt part of their vegetable diet. Of their animal food, the chief articles are, hogs, fowls, fiſh, and all ſorts of ſhell fiſh; but the lower people eat rats. The two firſt vegetable articles, with bread fruit, are what may be called the baſis of their food, at different times of the year, with fiſh and ſhell fiſh; for hogs, fowls, and turtle, ſeem only to be occaſional dainties, reſerved for their chiefs. Their food is generally dreſſed by baking, and they have the art of making, from different kinds of fruit, ſeveral diſhes which moſt of us eſteemed very good. The generality of them lay their victuals upon the firſt leaf they meet with, however dirty it may be; but when food is ſerved up to the chiefs, it is commonly laid upon green plantain leaves. The women are not excluded from eating with the men; but there are certain ranks or orders amongſt them that can neither eat nor drink together. This diſtinction begins with the king; but where it ends could not be learnt. They ſeem to have no ſet time for meals. They go to bed as ſoon as it is dark, and riſe with the dawn in the morning.

Their private diverſions are chiefly ſinging, dancing, and muſic performed by the women. The dancing of the men has a thouſand different motions with the hands, to which we are entire ſtrangers; and they are performed with an eaſe and grace which are not to be deſcribed but by thoſe who have ſeen them.

Whether their marriages be made laſting by any kind of ſolemn contract, our voyagers could not determine with preciſion; but it appeared that the bulk of the people ſatisfied themſelves with one wife. The chiefs, however, have commonly ſeveral women, though it appeared as if one only was looked upon as the miſtreſs of the family.

When any perſon of conſequence dies, his body is waſhed and decorated by ſome woman or women, who are appointed on the occaſion; and theſe women are not by their cuſtoms, to touch any food with their hands for many months afterwards; and it is remarkable, that the length of the time they are thus proſcribed, is the greater in proportion to the rank of the chief whom they had waſhed.

The concern of theſe people for the dead is moſt extraordinary. They beat their teeth with ſtones, ſtrike a ſhark's tooth into the head until the blood flows in ſtreams, and thruſt ſpears into the inner part of the thigh, into their ſides below the armpits, and through the cheeks into the mouth. All theſe operations convey an idea of ſuch rigorous diſcipline, as muſt require either an uncommon degree of affection, or the groſſeſt ſuperſtition, to exact. It ſhould be obſerved, however, that the more painful operations are only practiſed on account of the death of thoſe moſt nearly connected. Friendly Iſlands

Their long and general mourning proves, that they conſider death as a very great evil. And this is confirmed by a very odd cuſtom which they practiſe to avert it. They ſuppoſe that the Deity will accept of the little finger, as a ſort of ſacrifice efficacious enough to procure the recovery of their health. They cut it off with one of their ſtone hatchets. There appeared ſcarcely one in ten of them who was not thus mutilated in one or both hands. According to Captain King, it is common alſo for the inferior people to cut off a joint of their little finger on account of the ſickneſs of the chiefs to whom they belong.

They ſeem to have little conception of future puniſhment. They believe, however, that they are juſtly puniſhed upon earth; and conſequently uſe every method to render their divinities propitious. The Supreme Author of all things they call *Kallafootonga;* who, they ſay, is a female reſiding in the ſky, and directing the thunder, wind, rain, and in general all the changes of weather. They believe that when ſhe is angry with them, the productions of the earth are blaſted; that many things are deſtroyed by lightning; and that they themſelves are afflicted with ſickneſs and death as well as their hogs and other animals. When this anger abates, they ſuppoſe that every thing is reſtored to its natural order. They alſo admit a plurality of deities, though all inferior to *Kallafootonga.* They have leſs abſurd ſentiments about the immateriality and the immortality of the ſoul. They call it *life*, the living principle; or, what is more agreeable to their notions of it, *Otooa;* that is, a divinity or inviſible being.

Of the nature of their government no more is known than the general outline. According to the information received, the power of the king is unlimited, and the life and property of the ſubject are at his diſpoſal; and inſtances enough were ſeen to prove that the lower order of people have no property, nor ſafety for their perſons, but at the will of the chiefs to whom they reſpectively belong. When any one wants to ſpeak with the king or chief, he advances and ſits down before him with his legs acroſs; which is a poſture to which they are ſo much accuſtomed, that any other mode of ſitting is diſagreeable to them. To ſpeak to the king ſtanding would be accounted here as a ſtriking mark of rudeneſs.

Though ſome of the more potent chiefs may vie with the king in point of actual poſſeſſions, they fall very ſhort in rank and in certain marks of reſpect, which the collective body have agreed to pay the monarch. It is a particular privilege annexed to his ſovereignty, not to be punctured nor circumciſed, as all his ſubjects are. Whenever he walks out, every one whom he meets muſt ſit down till he has paſſed. No one is allowed to be over his head; on the contrary all muſt come under his feet; for there cannot be a greater outward mark of ſubmiſſion than that which is paid to the ſovereign and other great people of theſe iſlands by

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by their inferiors. The method is this: the perſon who is to pay obeiſance ſquats down before the chief, and bows the head to the ſole of his foot; which, when he ſits, is ſo placed that it cannot eaſily be come at; and having tapped or touched it with the under and upper ſide of the fingers of both hands, he riſes up and retires. The hands, after this application of them to the chief's feet, are in ſome caſes rendered uſeleſs for a time; for, until they be waſhed, they muſt not touch any kind of food. When the hands are in this ſtate, they call it *taboo rema*. *Taboo*, in general, ſignifies "forbidden," and *rema* is their word for "hand." Their great men are fond of a ſingular piece of luxury; which is, to have women ſit beſide them all night, and beat on different parts of their body until they go to ſleep; after which they relax a little of their labour, unleſs they appear likely to awake; in which caſe they redouble their drumming until they are again faſt aſleep.

1 Definition of friendſhip.

FRIENDSHIP may be defined, a mutual attachment ſubſiſting between two perſons: and ariſing, not merely from the general principle of benevolence, from emotions of gratitude for favours received, from views of intereſt, or from inſtinctive affection or animal paſſion; but from an opinion entertained by each of them, that the other is adorned with ſome amiable or reſpectable qualities.

2 Illuſtration of the above definition.

The object of the general principle of benevolence is *mankind*, not any particular individual. Gratitude regards the perſon from whom he who feels its emotions has received a favour, whether that perſon be a virtuous or vicious, a reſpectable or a contemptible, character: it prompts the perſon obliged to make a ſuitable return to his benefactor, but not to enter into any particular intimacy with him, merely on account of the favours which he has received. Many connections are formed, and dignified with the name of *friendſhip*, upon no other principle but the ſordid hope which one or perhaps each of the parties entertains of accompliſhing ſome ſelfiſh purpoſe through the aſſiſtance of the other: but ſuch a connexion is ſo baſe in its nature, and ſo tranſitory in its duration, as to render it unneceſſary for us to ſpend time in demonſtrating it to be unworthy of the name of friendſhip. The inſtinctive affection which a parent entertains for his child, as well as that which the child feels for his parent, ſeems intended by nature to form an union between the perſons thus related to each other: but the union between parents and children, when ſupported by no other principle but inſtinct, is different from friendſhip: it extends no farther than to cauſe the parent to provide for his child during his helpleſs years, and the child to look up to his parent for protection and ſupport. We need not mention that appetite which is the foundation of love, and is the proviſion which nature has made for the continuation of our ſpecies. This appetite alone, and unaſſiſted by ſome nobler principle, cannot give riſe to any connexion worthy of an honourable name.

After excluding theſe principles, we can refer the origin of friendſhip only to "an opinion entertained by each of the parties between whom it ſubſiſts, that the other is adorned with ſome amiable or reſpectable qualities." A connexion founded on different principles we cannot honour with the name of friendſhip; but that which flows from this pure ſource muſt be noble and virtuous. When two perſons of virtue and abilities contemplate each the other's character and conduct, they cannot but view them with complacency and eſteem. Habits and actions diſplaying prudence, fortitude, moderation, integrity, benevolence, and piety, naturally command the approbation of the impartial ſpectator, and even affect him with delight. But as we are diſpoſed to reviſit a landſcape the beauties of which we have contemplated with rapture, and read with frequent delight a poem in which genius has faithfully delineated ſome of the moſt enchanting ſcenes or the moſt intereſting events in nature; ſo we alſo become deſirous to enjoy frequent opportunities of contemplating a character diſtinguiſhed for eminent abilities and illuſtrious virtues. The ſociety of ſuch a perſon is preferred to his who is diſgraced by the oppoſite qualities. Hence, whenever men of truly reſpectable characters enjoy opportunities of mutual intercourſe, an attachment naturally takes place between them; entirely diſintereſted, and founded ſolely on the approbation with which the one cannot avoid regarding the conduct of the other. The eſteem which the one is thus induced to entertain for the other will lead them to ſeek frequent opportunities of enjoying each other's ſociety, mutually to aſk and liſten to advice, to truſt their moſt ſecret and important purpoſes to each other's confidence, and to be no leſs concerned each of them for the other's intereſt and honour than for his own. This, and this alone, is genuine friendſhip; founded on virtue, and on that approbation which virtue never fails to command: it is a natural conſequence of intercourſe between virtuous men.—Where it is once eſtabliſhed, it cannot die, while thoſe virtues to which it owes its origin continue to adorn the perſons between whom it ſubſiſts. Friendſhip.

3 Circumſtances favourable to the riſe and continuance of friendſhip.

But, perhaps, ſuch a pure and ſublime attachment can ſcarce be expected to exiſt among beings of ſo mixed and imperfect a character as mankind. The wiſe man of the ancient Stoics, or the Chriſtian who fully obeys the precepts, and follows the ſteps of his Saviour, might be capable of it; but, unfortunately, humanity never reaches ſuch perfection. Virtue and vice are ſo blended together in every human character, that while none is ſo worthleſs as to excite no other ſentiment but abhorrence, there is ſcarcely any ſo uniformly virtuous as to command unvaried eſteem or admiration. Even the pureſt and moſt diſintereſted of thoſe friendſhips which prevail among men, owe their origin to other meaner principles, as well as to that which has been mentioned as the principle of genuine friendſhip. There are certain circumſtances favourable, and others adverſe, to the formation and continuance of friendſhip. Theſe, making amends, as it were, for the imperfection of human virtue and human knowledge, lead men to overlook each other's faults and follies, and to unite in the bonds of friendſhip; a friendſhip which, though leſs ſolid, leſs generous, and leſs laſting, than that which we have above deſcribed, is yet attended with effects favourable to the happineſs of individuals, and to the intereſts of ſociety in general.

Equality of age is favourable to friendſhip. Infancy, manhood, and old age, differ ſo conſiderably from each other in their views, paſſions, and purſuits, that the *man* will ſeldom be diſpoſed to aſſociate with the *boy*

Friendſhip. or the *youth*, in preference to one who has had equal experience in the world with himſelf; and the *old man* will generally wiſh for the company of ſome ancient friend with whom he may ſpeak of "the days of former years."

They who cultivate the *ſame trade or profeſſion*, enjoy opportunities favourable to the formation of friendſhip. Being engaged among the ſame objects, and acquiring ſkill in the ſame arts, their knowledge, their ſentiments, and habits, are nearly the ſame; they cannot avoid frequent intercourſe with each other; they naturally enter into each other's prejudices and views, and therefore cannot but take pleaſure in each other's converſation and ſociety. Phyſicians, lawyers, and divines, form each of them a diſtinct body; and the members of each of thoſe bodies aſſociate with one another more readily than with men of a different profeſſion. It is related by Swift or Addiſon, that, in the beginning of the preſent century, there was a particular coffeehouſe in London which clergymen uſed to frequent, and that a ſon of the church ſcarcely ever ventured to ſhow his head in any other. In the days of Dryden, poets, and all who pretended to poetical genius or taſte, reſorted to *Will's*, as to another Parnaſſus to ſip cups of coffee, and now and then perhaps to drink of ſome more inſpiring liquor, inſtead of the waters of the fountain Hippocrene.

Equality of rank and fortune is alſo favourable to friendſhip. Seldom will a man of fortune be able to gain the ſincere friendſhip of any of his dependants. Though he treat them with the moſt obliging condeſcenſion, and load them with favours; yet ſtill, either the ſenſe of dependence, or reſentment for imaginary injuries, or impatience of the debt of gratitude, or ſome other ſimilar reaſon, will be likely to prevent them from regarding him with cordial affection. Servants are but rarely faithful even to the moſt indulgent maſter: Shakeſpeare's old Adam is a very amiable but a very uncommon character. Indeed you may as ſoon expect to find the virtues and the generous courage of the chevalier Bayard among our military men of the preſent age, as to find an old Adam among the preſent race of ſervants. It is no leſs vain for the poor man to hope to acquire a ſincere friend among his ſuperiors in rank and fortune. The ſuperior is generally diſpoſed to exact ſuch profound deference, ſuch gratitude, ſuch reſpect, even from the inferior whom he admits into his intimacy, that the equal amicable intercourſe of friendſhip can ſcarce ever take place between them. Among the letters of the younger Pliny, we are pleaſed to find many monuments of the goodneſs of his heart. A number of his epiſtles addreſſed to friends in meaner circumſtances appear to have been accompanied with very conſiderable preſents, which by his opulence he was well enabled to beſtow. But he takes care to let thoſe humble friends know the weight of the obligations which he conferred, and the vaſtneſs of the debt of gratitude which they owed to him, in ſuch plain, nay even indelicate terms, that though they might receive his favours with gratitude and regard him as their benefactor, yet they could never regard him as a man with whom they might cultivate the free eaſy intercourſe of friendſhip. Some one or other of the Greek writers mentions a ſingular inſtance of cordial friendſhip ſubſiſting between two perſons in unequal circumſtances. One of them dying before Friendſhip. the other, and leaving a wife and daughter to whom he had no fortune nor even means of ſubſiſtence to bequeath, enjoined his rich friend, in his will, to take the charge of them on himſelf, and to ſupport them in a liberal manner: nor did he entreat this from his humanity, but demanded it from his friendſhip. He had made a ſure proviſion for his family. His rich friend delayed not to comply with his dying injunction. He readily took upon himſelf the charge of the wife and daughter of his deceaſed friend, treated them with kindneſs, and at laſt divided his whole fortune equally between his own only daughter and the child of his friend. This is an agreeable inſtance of the power of friendſhip: but ſuch inſtances are not to be expected to occur frequently in ordinary life, any more than the Stoic virtue of Cato, or the modeſt piety of a Nelſon.

Similarity of taſte and temper will generally be found favourable to friendſhip. Two peeviſh men, indeed, will not long endure each other's company with much ſatisfaction; but two perſons of mild, humane diſpoſitions will naturally take delight in each other's ſociety and converſation. They who are charmed with the buſtle of a gay and active life, avoid the haunts of the indolent and contemplative, and join hand in hand to climb the heights of ambition, or tread the round of amuſement and diſſipation. Thoſe whom taſte leads to cultivate the elegant objects of literature amid the ſweets of a rural retirement, to wander through the grove, or recline on the brink of ſome romantic rill, and peruſe the pages of one of thoſe geniuſes who have ſhown themſelves able to enlighten the underſtanding, and to kindle the glow of generous ſentiment in the breaſt;—thoſe children of taſte frequently aſſociate in their elegant purſuits. We are pleaſed to read the correſpondence of Pliny and Tacitus, of Locke and Molineux, of Swift and Pope. We rejoice to find, that notwithſtanding the rivalry of learning and genius, taſte and philoſophy have a natural tendency to promote benevolence and friendſhip among their votaries. The buſtle of the world muſt be acknowledged to be generally unfavourable to friendſhip. When the heart is occupied with the ſordid objects of ambition, or avarice, or gay diſſipation, there is no room left for the pure and generous ſentiments of friendſhip. Intereſts often interfere, competitions and jealouſies ariſe, fatal to all the ſweets of ſocial intercourſe. It is in active life that virtue ſhines with the moſt brilliant luſtre; but ſeldom, alas! does pure virtue appear in the ſcenes of active life. How beautifully does the character of Atticus ſhine amid the characters of his illuſtrious cotemporaries! *ut Luna inter minores ignes!* Sylla, Cæſar, Cicero, Brutus, Antony, and Auguſtus, were eminent for their abilities and virtues; but being engaged in the buſtling purſuits of ambition, they ſeem to have been ſtrangers to the calm and elegant happineſs which Atticus enjoyed. Though thoſe of them who were cotemporaries could not avoid perceiving and admiring each other's merits, yet never did cordial friendſhip ſubſiſt between them. Even Cicero, who could ſo well define the duties and deſcribe the happineſs of friendſhip, yet appears to have but ſeldom enjoyed its delights. But Atticus, who conſtantly declined entering the ſcenes of public life,

Friendſhip. life, experienced ſuch happineſs in a private condition, as muſt have been more than an ample reward to him for ſhunning all the ſplendid purſuits of ambition. He was the diſintereſted friend of all thoſe eminent men, and enjoyed their eſteem and friendſhip. So upright was his character, ſo amiable his manners, that they who were mortal enemies to each other, yet agreed in cultivating at the ſame time the friendſhip of Atticus. None of them appear to have hated him on account of his attachment to their enemies; and while he was the friend of Cicero and Octavius, he was at the ſame time the protector of the wife of Antony. Perhaps the virtue of ſuch a character may be regarded as problematical. It may be alleged, that while ſuch inveterate diſſenſions aroſe among his friends, the neutrality which he preſerved was inconſiſtent with integrity. He has indeed been raſhly branded by ſome writers as an avaricious time-ſerving man. But no evidence appears to juſtify their aſſertions; on the contrary, the moſt reſpectable teſtimony, the niceſt ſcrutiny, exhibit his character in thoſe amiable colours in which we have choſen to view it. Atticus is indeed no ordinary character. The general principles of human nature, and the examples which moſt frequently occur in the world, naturally ſuggeſt a ſuſpicion, that had he been a man of genuine integrity, he muſt have obſerved a different tenor of conduct. But there is one circumſtance which tends to ſtrengthen conſiderably the reſpectable teſtimony of his cotemporaries in his behalf. In Cato, in Epictetus, in the philoſopher, who, while ſuffering under all the violence of an acute diſtemper, maintained to Pompey that pain was no evil, we have inſtances of the tenets of philoſophy oppoſing and repreſſing the principles of nature. We know how often religious enthuſiaſm has produced the ſame effects. But Atticus was the votary of the mild and elegant philoſophy of Epicurus; which, though there appears to have been a palpable inconſiſtency between its principles and the ſuperſtructure raiſed upon them, was yet in its general tendency not unfriendly to virtue, and recommended to its votaries that calm and innocent mode of life which Atticus cultivated. There is no ſmall reſemblance between the character of Atticus and that of Epicurus, the founder of this philoſophy. The ſame tenets ſeem to have produced the ſame effects on both; and we will venture to pronounce ſo high an encomium on the Epicurean philoſophy, as to aſſert, that it chiefly contributed to form the character of this amiable Roman.

We know not if we may venture to affirm, that friendſhips are moſt naturally contracted among perſons of the ſame ſex. We believe they often are. If ſimilarity of taſte, of ſentiments, of manners, be favourable to friendſhip, this cannot but happen. The diſtinction which nature has eſtabliſhed between the two ſexes, the new diſtinctions which are introduced by the different views with which their education is conducted, and the different duties which they are called to perform in life, have all a tendency to diſpoſe men and women to enter into habits of intimacy with perſons of their own ſex rather than with the other. Young girls have their peculiar amuſements, as boys have theirs: they knit and ſew together, conſult each other concerning their dreſs, and aſſociate at their idle hours. Young men, in the ſame manner, prefer the ſociety of their equals of the ſame ſex till Friendſhip. ſuch time as their hearts begin to feel the impulſe of a new paſſion. This ſoft paſſion, indeed, cauſes the youth to prefer the company of his favourite maid to that of his deareſt companion; and it perhaps cauſes the virgin to view her female companions with a jealous eye, while ſhe fears that their charms may win the heart of the youth, whoſe fond regard ſhe herſelf wiſhes to engage. But the fears, the jealouſies, the timidity, nay even the fondneſs of love, are incompatible with friendſhip. Though the lover and his miſtreſs be dear to each other, yet the free confidence of friendſhip cannot take place between them. They dare not yet venture to truſt to each other all the ſecrets of their hearts. But if their mutual wiſhes be crowned by marriage; then, indeed, as their intereſts become the ſame, if the tranſports of love are not ſucceeded by the calm delights and the free confidence of friendſhip, they muſt be unhappy. The marriage ſtate is peculiarly favourable to friendſhip. Perſons whoſe relations to each other are the more remote, will often find circumſtances concurring to induce them to cultivate a friendly intercourſe with each other. But here indifference is almoſt impoſſible. It is abſolutely requiſite, in order that they may not render each other miſerable, that the huſband and the wife be united in the bonds of friendſhip. This ſeems even to be one of the great laws of nature, by means of which proviſion is made for the happineſs and the preſervation of ſociety. But though the wife and the huſband be particularly attached to each other by the ties of friendſhip no leſs than by thoſe of love, yet their mutual affection will not detach them from the reſt of the world: their relations to the ſociety around them will ſtill remain; the huſband will ſtill cultivate the intimacy of thoſe of his own ſex, and the wife will ſtill chooſe female in preference to male friends. Upon even a ſuperficial view of life, we find reaſon to declare without heſitation, that acquaintance and intimacy moſt naturally take place among perſons of the ſame ſex. The huſband and the wife are more than friends; they are *one bone and one fleſh*. It has been ſometimes ſlightly inſinuated, and ſometimes more openly aſſerted, by people who have but careleſsly viewed the phenomena of ſocial life, or have been diſpoſed to cavil againſt the fair ſex, that women are incapable of ſincerity or conſtancy in friendſhip with each other. But it ſeems unneceſſary to offer a ſerious refutation of this cavil. Neither is the general character of the female ſex ſo inferior to that of the male, nor are their circumſtances ſo very different from ours, as to render them totally incapable of thoſe virtues which are neceſſary to eſtabliſh and ſupport mutual friendſhip. They are in general poſſeſſed of more exquiſite ſenſibility, nicer delicacy of taſte, and a juſter ſenſe of propriety, than we: nor are they deſtitute of generoſity, fidelity, and firmneſs. But ſuch qualities are peculiarly favourable to friendſhip; they communicate a certain charm to the manners of the perſon who is adorned with them; they render the heart ſuſceptible of generous diſintereſted attachment; and they elevate the ſoul above levity, inſincerity, and meanneſs. Competitions and jealouſies muſt no doubt ariſe now and then even among the moſt amiable of the female ſex, as well as among us. Theſe will preclude or deſtroy

Friendſhip. friendſhip. But the rivalry of beauty of dreſs, of faſhion, is not oftener fatal to friendſhip among the fair ſex, than the conteſts of pride, avarice, vanity, and ambition among their haughty lords. If friendſhip be ranked among the virtues, it is not leſs a female than a male virtue.

5 Relations of conſanguinity.

The delightful intercourſe and intimacy of friendſhip may be naturally expected to ſubſiſt not only between the huſband and the wife, but among all who are connected by any of the relations of conſanguinity. The power of inſtinct does not always continue to unite the parent and the child. Its offices are of a temporary nature; but when theſe are performed, it ceaſes to operate. During the infancy, the childhood, and even the youth of his ſon or daughter, the parent watches over them with fond affection, and labours with anxious aſſiduity to promote their welfare, for no other reaſon but becauſe the yearnings of paternal affection draw him towards them. But as they advance farther in life, and become able to care for themſelves, it has been ſo ordered by the wiſdom of nature, that the attachment of the parent almoſt dies away, unleſs the grateful affection and the merit of his children afford him reaſon to rejoice over them and bleſs them. How ſhocking, how miſerable, the condition of that family, whoſe members are not united by the mutual eſteem and confidence of friendſhip! where the parent views his children with jealouſy, ſhame, indignation, or ſorrow: and the children anxiouſly avoid the ſociety of their parents! Their intereſts are ſo nearly connected; they have ſo many occaſions for acting in concert, and muſt live ſo long together; that we may almoſt venture to affirm, that the parent and the child, like the huſband and the wife, muſt be either friends or enemies. But the ties of nature, the influence of habit, ſentiments, and circumſtances, all concur to form between them the ſacred connexion of friendſhip. Brothers and ſiſters, the children of the ſame parents, and for a while members of the ſame family, may be expected to regard each other through life with kindneſs and eſteem; and theſe we would rather chooſe to attribute to a rational attachment, founded on certain principles, than to a blind inſtinctive affection.

Theſe are a few of the diſtinctions and relations in ſociety which appear moſt favourable to friendſhip.—Were we to deſcend to minuter particulars, we might enumerate all the varieties of taſte, of temper, and of circumſtances, by which mankind are diſtinguiſhed from one another, and diſtributed into particular claſſes. But this would be too tedious, and does not appear neceſſary.

6 Laws of friendſhip.

As friendſhip is an attachment which takes place between certain human characters when placed in certain circumſtances, there muſt therefore be laws for ſupporting the attachment and regulating the intercourſe of friendſhip. Mutual eſteem is the baſis on which true friendſhip is eſtabliſhed; and the intercourſe of friendſhip ought ſurely to be connected in ſuch a manner that this foundation be not injured. Friendſhip muſt diminiſh neither our benevolence nor prudence: it muſt not ſeduce us from an honeſt attention to our private intereſt, nor contract our ſocial affections.

Sincerity may be conſidered as the firſt law of friendſhip. Artifice and hypocriſy are inimical to all ſocial intercourſe. Between the deceitful and the honeſt, Friendſhip. friendſhip can never ſubſiſt. For a while, the one may impoſe on the other; unſuſpicious integrity may not be able to ſee through the maſk under which the hideous features of ſelfiſh cunning are veiled; but the deceitful friend muſt ever be a ſtranger to the delightful ſentiments of genuine friendſhip. To enjoy theſe, your virtues muſt be ſincere, your affection for the perſon whom you call your friend unfeigned; in communicating to each other your ſentiments, in offering and liſtening to mutual advice, in joining to proſecute the ſame deſigns, or ſhare in the ſame amuſements, candid ſincerity muſt ſtill be obſerved between you. Attempt not to perſuade each other, that your mutual affection is more ardent, or your mutual eſteem more profound, than it really is. If the ſentiments or opinions which the one expreſſes appear to the other improper or ill-founded, let not a falſe delicacy prevent him from declaring his reaſons againſt them; let him not applaud where, if he were ſincere, he muſt blame. Join not even your friend in an undertaking which you ſecretly diſlike, or an amuſement inſufferably diſagreeable to you. You cannot, conſiſtently with ſincerity and candour: and you will ſoon begin to think the bleſſings of friendſhip too dear, when bought at the price of ſuch ſacrifices.

But though ſincerity is to be faithfully obſerved in the intercourſe of friendſhip; yet the harſhneſs of contradiction muſt be carefully avoided. Thoſe obliging manners which are ſo agreeable in an acquaintance or caſual companion, are ſtill more ſo in a friend. If they are neceſſary to recommend the advantages of ſocial intercourſe in general to the members of ſociety, they are no leſs neceſſary to communicate a charm to the intercourſe of friendſhip. People often think themſelves entitled to behave to thoſe whom they call their friends, and whoſe intereſts they profeſs to regard as their own, with harſhneſs, negligence, and indiſcreet familiarity; but nothing can be more fatal to friendſhip. It is a well known maxim, eſtabliſhed by general and uniform experience, that *too much familiarity occaſions mutual contempt*. And indeed how can it be otherwiſe? Mild obliging manners are underſtood as the natural and genuine expreſſions of kindneſs and affection: boiſterous rudeneſs, petulance, and neglect, are naturally conſidered as expreſſive of oppoſite ſentiments. But if friendſhip aſſume the tone, the carriage and the language of enmity or indifference, it muſt ſoon loſe all its native charms and advantages. Let the friend, as well as the caſual companion, when he finds reaſon to diſapprove of the ſentiments and conduct, or to diſſent from the opinions of his friend, expreſs himſelf in the gentleſt terms, with honeſty and ſincerity, but without careleſsneſs or harſhneſs. Let no frequency of intercourſe nor union of intereſts ever tempt to careleſs or contemptuous familiarity. Stiff and unmeaning ceremony may be baniſhed; but eaſe, and delicacy, and reſpectful deference, and obliging attention, muſt ſupply its room. Much of the unhappineſs of the marriage ſtate, and much of the mutual uneaſineſs which ariſes among thoſe who are related by the endearing ties of conſanguinity, is occaſioned by the parties who are thus cloſely connected, thinking it unneceſſary to obſerve the ordinary rules of good breeding in their mutual intercourſe. Even kindneſs puts

Friendſhip. puts on a diſguſting garb, and aſſumes a harſh aſpect. But mutual kindneſs cannot there long ſubſiſt. Home, which ought to be a ſanctuary to ſhelter from the anxieties and ills of life, a little paradiſe where thoſe pure and innocent pleaſures might be enjoyed which afford the moſt genuine happineſs, and which are not to be taſted in the buſtle of the buſy and the diſſipation of the gay world; home thus becomes a place of torment, which is never entered but with pain and unwillingneſs; and from which the ſon, the daughter, the huſband, and the wife, eagerly ſeize every opportunity to eſcape.

Mutual confidence is the very ſoul of friendſhip. If friendſhip be rightly defined to be a mutual affection founded on mutual eſteem, thoſe who are united in the bonds of friendſhip cannot but repoſe mutual confidence in each other. Am I conſcious of none but generous worthy ſentiments, and none but upright honeſt intentions? I readily diſcloſe all the ſecrets of my ſoul to him whom I regard as capable only of ſimilar deſigns and ſimilar ſentiments. But it may be aſked, how far the confidence of friendſhip ought to be carried? Muſt I reveal to my friend all my ſentiments, opinions, and deſigns? Muſt I communicate to one friend the ſecrets which have been intruſted to me by another? Or muſt I rather obſerve the moſt ſuſpicious caution in my intercourſe with my friends, remembering that he who is now my friend may one day become my enemy? It ſeems moſt prudent to obſerve a medium between ſuſpicious caution and unlimited confidence. Were human virtue perfect, and were there no inſtances of friends ever becoming enemies, thoſe who regard each other with friendly affection might very reaſonably be required to ſet no bounds to their mutual confidence. But as this is far from being the caſe, different meaſures are to be obſerved. Contract no friendſhips, if you think it neceſſary to treat a friend with the ſame reſerve as an enemy. Yet venture not to diſcloſe to your friend all the fooliſh or evil deſigns which the wantonneſs of imagination may ſeduce you to form. When you feel the emotions of pride, of vanity, or of any evil paſſion, if you are able to repreſs them by the ſtrength of reaſon and conſcience, it ſeems unneceſſary for you to tell the ſtruggle, or to boaſt of the victory. If, at any former period of life, you have been ſo unfortunate as to commit actions which you cannot now recollect without ſhame and contrition, there can be no reaſon why you may not, as far as poſſible, bury the remembrance of them in your own breaſt. In ſhort, not to become tedious by deſcending to minute particulars, the laws of friendſhip do not require friends to unboſom themſelves to each other any farther than is neceſſary—to give them juſt ideas of each other's character and temper,—to enable them to be ſerviceable to each other in the proſecution of honeſt deſigns,—and to afford each of them proper opportunities of exciting the other to virtue and wiſdom, and of interpoſing his influence to preſerve him from vice and folly. Whatever is neceſſary for any of theſe purpoſes ought to be mutually communicated; whatever is not, may be concealed without violating the laws of friendſhip. As mutual eſteem is the foundation of friendſhip, and as human friendſhips are not always laſting, you ought not to pour into the ear of your friend all the impertinences which you may happen to conceive, nor even all the Friendſhip. projects which may float in your imagination: but as much of the felicity of friendſhip ariſes from the mutual confidence to which it affords room, call not any man your friend in whoſe preſence you find it proper to obſerve the ſame ſuſpicious caution as if he were your enemy. The ancients, who talked of friendſhip with enthuſiaſm as one of the moſt elevated among the virtues, required a ſtill cloſer union and a more diſintereſted attachment among friends than we dare venture to inſiſt upon. The mutual duties which they have deſcribed as incumbent on friends, appear ſomewhat extravagant. Among other things, ſome of them have gone ſo far as to require a degree of mutual confidence which would ſoon deſtroy all confidence, and could not fail to counteract all the purpoſes of friendſhip: they have required one friend to communicate to another, not only all his own thoughts and purpoſes, but even thoſe ſecrets which have been confided to his honour by any other friend. But the evil conſequences which would reſult are eaſily to be foreſeen. Perhaps, like Atticus, you enjoy the friendſhip of men who are mutual enemies; and by communicating the ſecrets of the one to the other, you will then become the betrayer of both. Or, though not abſolutely enemies, yet thoſe who are *your* friends may happen not to be in habits of friendſhip with each other; and they may then perhaps not ſcruple to divulge thoſe ſecrets of one another which you have imprudently blabbed to them. Indeed, might we ſuppoſe all mankind abſolutely faultleſs, and not liable to moral imperfection, we need not fear theſe bad conſequences from unbounded confidence in our friends. But friendſhip would in ſuch a ſtate of ſociety be unknown: juſt as in the golden age of the poets there are ſuppoſed to have been no diſtinctions of property. We cannot here forbear dropping an obſervation, which will readily be acknowledged as juſt by all who have any tolerable knowledge of the morality of the philoſophers of ancient Greece. All their doctrines and precepts appear calculated for a different order of beings than mankind. They glanced careleſsly at the phenomena of the moral world; and gleaning a few facts, immediately ſet themſelves to erect ſyſtems: From theſe, however wild and theoretical, they then pretended to deduce laws for the regulation of human conduct; and their rules are generally ſuch as might be expected from the means which they appear to have employed in order to arrive at them. An apology has however been offered for ſome of them, which, in our opinion, could occur only to ſuperficial obſervers of human life. It has been alleged in behalf of the Stoics, that their ſyſtem indeed required more exalted virtue than human nature is capable of attaining; but that, notwithſtanding this, it could not fail to produce the happieſt effects on the manners and ſentiments of its votaries. Inſtances, too, have been produced in ſupport of this aſſertion; a Cato, an Epictetus, an Antoninus. When we contemplate a model of perfection beyond what we can hope to reach, ſay the advocates of the Stoic philoſophy, though we deſpair of attaining, yet we are prompted to aſpire after it. Now, the moſt natural way of reaſoning here ſeems to lead to a very different concluſion. If an object is ſet before me which I muſt not hope to obtain, I am unwilling to waſte my time and

exhauſt

Friendſhip. exhauſt my vigour in the purſuit of it: bid me aſcend an inacceſſible height, I view the vale below with new fondneſs. Philoſophy, as well as ſuperſtition and enthuſiaſm, might in a few inſtances triumph over the principles of nature; but was it always equally powerful? Were all the diſciples of Zeno Catos or Epictetuſes? Have all the monks and anchorites of the Romiſh church been holy as the founders of their orders? No: The Greek philoſophers who infeſted Rome, and taught thoſe *whimſical* doctrines which we hear frequently dignified with the name *ſublime*, were ſingularly corrupted and licentious in all their manners. If thoſe of the *regular* clergy of the church of Rome have been always more pure, they have been cruelly calumniated. Aſk, then, only what I am capable of performing: if you demand what is above my ſtrength, I ſit ſtill in indolence. In its general tendency, the Stoic philoſophy was favourable rather to vice than to virtue.

But we have not yet exhauſted all the duties of friendſhip. We have inculcated ſincerity, and mutual reſpect and obligingneſs of manners; we have alſo endeavoured to aſcertain what degree of mutual confidence ought to take place between friends. But an important queſtion ſtill remains to be conſidered: how far is an *union of intereſts* to take place between friends? Am I to ſtudy the intereſt of my friend in preference to my own? May I lawfully injure others, in order to ſerve him? Here, too, we muſt conſider the circumſtances and the ſtrength of human nature; and let us beware of impoſing burdens too heavy to be borne. The greater and more perfect the union which reigns in ſociety, the greater will be its ſtrength and happineſs; the cloſer the union of friends, the more advantages will each of them derive from their union. Where other ties beſides thoſe of friendſhip concur to unite two individuals, their intereſts will be more cloſely conjoined than if they were connected by the ties of friendſhip alone. The order of nature ſeems here to be,—the huſband and wife—the parent and child—brothers and ſiſters, the offſpring of the ſame parents—friends, connected by the ties of friendſhip alone. And, if we may preſume to gueſs at the intentions of the Author of nature from what we behold in his works and read in his word, the cloſeſt union in ſociety ought to be that between the huſband and the wife; their intereſts are altogether the ſame; they ought mutually to forego convenience and gratification for each other's ſake. The intereſts of parents and children are ſomewhat leſs cloſely connected; much is due from the one to the other, but ſomewhat leſs than in the former relation; their intereſts may ſometimes be ſeparate, but never ought to be oppoſite. Next come brethren, and other more diſtant relations; and next, the friend. In theſe caſes, where we ſuppoſe the attachment of friendſhip to operate together with the ties of nature, we perceive that intereſts are variouſly united, and various duties are due; ſcarcely in any of them does it appear that the intereſts of two can become entirely one. Still leſs can that be expected to happen, where the ties of friendſhip act not in concert with thoſe of nature. We give up, therefore, all thoſe romantic notions, which ſome have ſo earneſtly inſiſted on, of requiring the friend to conſider his friend as himſelf. We cannot expect any two individuals to poſſeſs preciſely the ſame degree of knowledge, to entertain exactly the ſame ſentiments, or to ſtand in circumſtances preciſely ſimilar. But till this happen, the intereſts of two can never be preciſely the ſame. And we will not, therefore, require the friend actually to prefer his friend to himſelf; nay, we will even allow him to prefer himſelf to his friend; convinced that ſuch is the deſign of nature, and that by preſuming to counteract the principles of nature we ſhall be able to ſerve no uſeful purpoſe. But as far as the firſt principles of human action and the inſtitutions of ſociety permit, we may reaſonably require of friends, that they mutually endeavour to contribute each to the other's intereſt. You will not deſert your own family, nor neglect what is abſolutely neceſſary for your own preſervation, in order that you may ſerve a friend. It is not requiſite that you be either a Damon or a Pythias. Away with what is romantic; but ſcruple not to ſubmit to what is natural and reaſonable. When your friend needs your direction and advice, freely and honeſtly give it: does he need more than advice; your active exertions in his behalf? the laws of friendſhip require you not to refuſe them. Is it neceſſary for him to receive ſtill more ſubſtantial aſſiſtance? You may even be expected to aid him with your fortune. But remember, that even the amiable principle of benevolence muſt be ſubject to the directions of prudence; if incapable of taking care of ourſelves, we cannot be expected to contribute to the good of others: ſociety would not be favourable to the happineſs of the human race, if every individual ſtudied the general intereſt ſo far as to neglect his own. We are not born to be citizens of the world; but Europeans, Britons, Engliſhmen or Scotchmen. Let every one, then, ſeek the intereſt and happineſs of his friends with whom he is connected by the laws of friendſhip alone, in ſubordination to his own particular intereſt and happineſs, and to the intereſt and happineſs of thoſe with whom he is connected by the ties of nature and the general inſtitutions of ſociety. Engage not in the ſervice of your friend, nor laviſh your fortune in his behalf, if by that means you are likely to injure either yourſelf or your family. Still leſs will you think it requiſite to carry your friendſhip to ſuch romantic exceſs as to commit crimes in the ſervice of your friend. The ancients, whoſe ideas of the nature and duties of friendſhip were romantic and extravagant, have, ſome of them, required that a friend ſhould heſitate at no action, however atrociouſly wicked, by which he can be uſeful to his friend. Have I been guilty of theft or murder, or any other heinous violation of the laws of morality or the inſtitutions of ſociety: when I am brought to juſtice for my crime, if you, being my friend, are appointed to ſit as my judge, the laws of friendſhip, ſay thoſe admirable maſters of morality, require that you pronounce me innocent, though convinced of my guilt. But we need not declaim againſt the abſurdity of enjoining ſuch baſe deeds as duties of friendſhip. The idea of a connection, the laws of which are inimical to the order of ſociety, muſt ſtrike with horror every perſon who thinks of it. Such a connection is the union of a knot of villains, conſpiring againſt the peace, nay even the exiſtence of ſociety.

Friendſhip.

7 General view of the advantages of friendſhip.

Such we apprehend to be the nature of rational friendſhip; ſuch the circumſtances in the order of nature

Friendſhip. ture and of ſociety which are moſt favourable to this union; and ſuch the duties, by the performance of which it may be maintained. When founded on theſe principles, and regulated by theſe laws, friendſhip is truly virtuous, and cannot but be highly beneficial to the individuals between whom it ſubſiſts, and to the intereſt of ſociety in general. How delightful to have ſome perſon of an amiable and virtuous character in whom you can confide; who will join with you in the proſecution of virtuous deſigns, or will be ready to call you back when you heedleſsly ſtray into the paths of vice and folly! who will adminiſter to you honeſt, upright advice; will rejoice in your proſperity, will glory over your virtues, and will be ready to conſole and relieve you when ſinking under the preſſure of diſtreſs! Muſt not your connexion with ſuch a perſon be favourable to your virtue, your intereſt, and your happineſs? When we ſurvey any ſublime or beauteous ſcene in nature, we wiſh for ſome perſon of congenial taſte and feelings to participate with us in the noble enjoyments which the proſpect affords; when we read any fine piece of compoſition, the pleaſure which we receive from it is more exquiſite if others join with us in applauding it. The landſcape which we have often ſurveyed, the poem which we have often read, pleaſe us anew, with all the charms of novelty, when we have an opportunity of pointing out their beauties to ſome perſon to whom they have been hitherto unknown. Friendſhip communicates new charms and a more delicate reliſh to all our moſt refined and elegant pleaſures. It enlivens our joys, it ſoothes and alleviates our ſorrows. What Cicero has ſaid of polite letters and philoſophy, may be with ſtill ſtronger propriety ſaid of friendſhip. In every condition of life the influence of virtuous friendſhip is favourable to our welfare and our happineſs: in proſperity; in adverſity; in the ſilence and tranquillity of retirement, as well as amid the hurry of buſineſs; in the boſom of your family, and when ſurrounded by your neareſt connections, no leſs than when removed to a ſtrange country. Indeed, whatever advantages ſociety beſtows above what are to be enjoyed in a ſavage ſtate, not leſs numerous nor leſs important are thoſe which we may derive from uniting in the bonds of friendſhip, rather than living in a ſtate of enmity or indifference.

Mistakes in forming friendſhips and conſequent inconſtancy. But though friendſhip, when founded on mutual eſteem, and regulated by the laws of prudence, benevolence, and honeſty, be productive of ſo many happy effects; yet many inſtances occur in the world, in which connexions dignified with the name of friendſhip are unfavourable both to the virtue and the happineſs of thoſe between whom they ſubſiſt. When men aſſociate from views of convenience; when their union is haſtily formed without a knowledge of each other's temper and character; when they are drawn together by accident, as when they happen to agree in the purſuits of the ſame intereſts or pleaſures; when the young and the gay reſort together to the haunts of diſſipation, and the covetous and ambitious find it convenient to toil in concert for riches and power: on all ſuch occaſions, the connexion which is formed and dignified with the name of friendſhip is unworthy of that honourable appellation. It is not virtuous; it is productive of no happy effects, and is quickly diſſolved. He, therefore, who is not incapable of virtuous friendſhip, and is deſirous of enjoying its advantages, muſt carefully conſider the nature of the connexion which he wiſhes to form, gain a thorough acquaintance with the character of the perſon whoſe eſteem and affection he wiſhes to acquire, and attend to thoſe rules by the obſervance of which true friendſhip may be maintained. Friendſhip.

Many inſtances are related, which ſhow what power it is poſſible for friendſhip to acquire over the human heart. We need not here repeat the well known ſtory of Damon and Pythias, whoſe generous friendſhip afforded a ſpectacle which ſoftened even the ſavage heart of Dionyſius. It is known to every ſchool-boy; and, after the affecting narrative of Valerius Maximus, has been ſtudiouſly detailed and commented on by almoſt every ſucceeding ſtory-teller or moraliſt. Addiſon, in one of his Spectators, gives a beautiful little relation, we know not upon what authority, which finely illuſtrates the power of both friendſhip and love. Two male negroes, in one of our Weſt Indian iſlands, nearly of the ſame age, and eminent among their fellows in ſlavery for gracefulneſs of figure, ſtrength, agility, and dexterity, were alſo diſtinguiſhed for their mutual friendſhip and for their common attachment to a young female negro, who was generally eſteemed the moſt beautiful of her complexion in the whole iſland. The young female appeared to be equally pleaſed with both her lovers; and was willing to accept either of them for a huſband, provided they could agree between themſelves which of them ſhould yield to the pretenſions of the other. But here lay the difficulty; for while neither would treacherouſly ſupplant, neither of them was willing to yield to his friend. The two youths, therefore, long ſuffered the ſevereſt affliction, while their hearts were torn between love and friendſhip. At length, when they were no longer able to endure the agony of ſuch a conteſt, being ſtill unable to repreſs their paſſion for their lovely countrywoman, and incapable of violating the laws of friendſhip,—on a certain day, they both, in company with the object of their ill-fated love, retired into a wood adjoining to the ſcene of their labours. There, after fondly embracing the maid, calling her by a thouſand endearing names, and lamenting their own unhappy fate, they ſtabbed a knife into her breaſt; which, while ſtill reeking with her blood, was by each of them in his turn plunged into his own. Her cries reached the people who were at work in the next field: ſome of them haſtening to the ſpot, found her expiring, and the two youths already dead beſide her. 9 Relation illuſtrating the power of friendſhip over the human heart,

We have introduced this little narrative as a ſtriking inſtance of the noble effects which naturally reſult from genuine friendſhip. Here we ſee it ſuperior to the force of the moſt violent of paſſions. Had the elevated ſouls of thoſe negro youths been refined and enlightened by culture and education in the principles of morality and true religion, we may reaſonably ſuppoſe that their friendſhip would have triumphed over their love, without prompting them to the raſh and deſperate deed which they committed.

Friendſhip, thus amiable in its character, thus beneficial in its influence and effects, the theme of unbounded panegyric to the philoſophers and moraliſts of every age, has been ſaid by ſome reſpectable modern writers to be inconſiſtent with the ſpirit of that holy 10 not inconſiſtent with the ſpirit of Chriſtianity.

religion

Friendſhip. religion which we profeſs, and which we regard as the revelation of heaven. General benevolence is frequently inculcated through the goſpel: "Jeſus often earneſtly intreated his diſciples, "to love one another;" and directed them in what manner to diſplay their mutual love, by telling them that "whatſoever things they could reaſonably wiſh to receive from others, the ſame ought they to do to them." The writers of the epiſtles often enlarge on the topics of charity and brotherly love. But private friendſhip is nowhere recommended in the code of Chriſtianity. Nay, it is ſo inconſiſtent with that univerſal benevolence which the goſpel enjoins, that where the one is recommended and enforced, the other may be underſtood to be tacitly forbidden. But can that religion be true, or can it be favourable to the happineſs of its votaries, which is inimical, nay, which is even not friendly to virtuous friendſhip? Such are the ſuggeſtions of Lord Shafteſbury and Soame Jenyns on this head.

We muſt grant them, that the ſyſtem of morals or religion which diſcourages a connection ſo noble in its origin, ſo amiable in its character, and ſo beneficial in its influence, as virtuous friendſhip, is rather unfavourable to the happineſs and virtue of its votaries. But we muſt conſider the genius of Chriſtianity with more careful attention, before we ſuffer ourſelves to be perſuaded that friendſhip is inconſiſtent with it. Univerſal benevolence is, indeed, inculcated in the goſpel: we are required to love our neighbours as ourſelves: and our Saviour ſeems to inſinuate, in the ſtory of the humane Samaritan, that we ought to regard as neighbours all our brethren of the human race, however ſeparated from us by any of the diſtinctions of ſociety. But it would be unfair to conclude from this, that the great Author of the goſpel meant to aboliſh the order of ſocial life, or to oppoſe the ties of nature. Theſe may ſtill be reſpected, though the laws of this benevolence be obeyed. The parent is not required to deſert his child, in order that he may aſſiſt or relieve his neighbour; nor the child to leave his parent to periſh under the infirmities of old age, while he haſtens to lend aſſiſtance to a ſtranger. The goſpel was not intended to diſſolve communities, or to abrogate the diſtinctions of rank. In Jeſus, the end of the ceremonial law was accompliſhed: by him, therefore, that burden of types and ceremonies with which the Jews had been loaded was taken away. But he who aboliſhed the ceremonial law declared, that the obligations of the moral law ſhould be more permanent than heaven or earth: The duties which it enjoined were ſtill to be religiouſly diſcharged: The precepts of the goſpel were to illuſtrate and enforce, not to contradict, the inſtitutions of the moral law. The relative duties of parents and children were ſtill to be performed; though men were directed not to confine all their ſentiments of benevolence to domeſtic relations. Jeſus, in his conduct, did not ſet himſelf to oppoſe the order of ſociety. In various parts of the New Teſtament all the ſocial duties are defined and enforced; the mutual duties of parents and children, of huſbands and wives, and of maſters and ſervants. The ſubmiſſion of all the members of a community to that power which is veſted with the authority of the whole, is alſo ſtrictly enjoined in the goſpel. Jeſus, when in his laſt moments he recommended his mother to the protection of his beloved diſciple, choſe to aſk *him* to conſider *her* as a parent; and directed *her* to expect from *him* the reſpect and kindneſs of a ſon. Theſe facts and obſervations teach us in what ſenſe to underſtand that univerſal benevolence which is inculcated in the goſpel. Though we are to love all mankind, yet it is not neceſſary that all the individuals of the human race ſhare our affection alike. Were we powerful, and wiſe, and benevolent, as the Deity, ſuch extenſive benevolence might be required of us: But our ſphere of action and obſervation is narrow; we cannot extend our acquaintance or influence beyond a very limited circle. Were we to endeavour to be equally uſeful to all mankind, we ſhould become incapable of being uſeful to any individual. We cannot become citizens of the world in the ſenſe in which ſome philoſophers have affected to call themſelves ſuch, without becoming outcaſts from every particular ſociety. A ſon, a brother, a countryman, a ſtranger, lie around you, each in circumſtances of extreme diſtreſs; you pity their misfortunes, and would gladly adminiſter relief; but ſuch is your benevolence, that you feel preciſely the ſame degree of compaſſion for each of them; you cannot determine to whom you ſhould firſt ſtretch out an helping hand; and you therefore ſtand like that venerable aſs of the ſchoolmen, whoſe tantalizing ſituation between two bundles of hay has been ſo long celebrated and lamented by metaphyſicians; and ſuffer ſon, and brother, and countryman, and ſtranger, to periſh, without relieving any of them by your kind offices. It is therefore the deſign of the goſpel, that we ſhould ſubmit to the laws of nature, and comply with the inſtitutions of ſociety. Firſt, attend to ſelf-preſervation; next, perform the duties of a wife or huſband,—a parent,—a child,—a brother,—a citizen,—an individual of the human race. You will do well, indeed, to regard all mankind with benevolence; but your benevolence will be unavailing to the objects of it, if you overlook the diſtinctions of nature and thoſe inſtitutions which ſupport the union of ſocial life.

Friendſhip.

But if the ſpirit of Chriſtianity be not inimical to the inſtitutions and relations of ſociety, neither can it be unfavourable to friendſhip. If that benevolence which the goſpel enjoins admit of any modifications, why not of that particular modification which conſtitutes private friendſhip? It is not, indeed, directly enjoined; but neither is it forbidden. It is perfectly conſiſtent with the general tendency and ſpirit of the goſpel ſyſtem: being favourable to the intereſts of ſociety, it cannot but be agreeable to our holy religion.

But it is recommended by no direct precept, ſay thoſe who would repreſent Chriſtianity as inimical to it; while it has been the favourite theme of the philoſophers and moraliſts of the heathen world.

But why ſhould friendſhip be recommended by means different from thoſe which the goſpel employs for the purpoſe? Make yourſelf well acquainted with that admirable ſyſtem which you ſo earneſtly oppoſe; you will find that even the duties of private friendſhip are better explained and more powerfully enforced in the goſpel, than by all the heathen philoſophers and poets from Heſiod to Plutarch. The goſpel makes a diſtinction between the virtuous and the vicious; it repreſents one character as more amiable and reſpectable than another. As it diſtinguiſhes between virtue and vice,

vice, between piety and impiety; ſo its great object is to deter us from vice, and to encourage us to the practice of virtue. It cannot be ſuppoſed, then, that the goſpel will direct us to aſſociate indifferently with virtuous and profligate characters. It does not. It directs us to ſeek improvement, by aſſociating with thoſe whom we have reaſon to eſteem. It directs thoſe who are incorrigibly wicked to be expelled from ſociety. What is this but to command us to enter into habits of intimacy wherever there is ground for mutual eſteem? But this is the only baſis of genuine friendſhip. When all the means which lead to a certain end are laid before you, and when you are particularly directed by ſome high authority to employ thoſe means; though the end which you thus attain be not pointed out, yet the commanding you to employ ſuch a ſeries of means, is evidently the ſame as if you were directed to accompliſh the purpoſe to which they tend. Thus, though the precepts of Chriſtianity do not directly enjoin private friendſhip; yet they have a direct tendency to form thoſe exalted characters who alone are capable of true friendſhip; they inculcate thoſe virtues which naturally give riſe to this generous attachment, and are abſolutely neceſſary to ſupport it where it is formed; they inculcate benevolence by the moſt effectual motives, and admit of modifications of that benevolence, correſpondent to the relations and inſtitutions of ſociety: And therefore they may be conſidered in as ſtrong and direct terms as if it had been expreſsly ſaid, "Cultivate private friendſhip." Beſides, friendſhip is rather an *accident* of ſociety, a natural conſequence of our character as moral and ſocial beings, than a relation to be regulated and defined by inſtitutions.

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This union, ſo natural between virtuous perſons, has been countenanced by the example of the Author of our religion; to whoſe life, no leſs than to his doctrines and precepts, we will do well to look for a ſtandard by which we may regulate our conduct. We allude to two remarkable inſtances which occur in the evangelical hiſtory; and with the recital of which, as ſtated in all their ſtriking circumſtances by a very elegant writer *, we ſhall conclude the preſent article.

V Melth, Eſq. he conding e to his nſlation Cicero's dius

"The evangeliſt, in relating the miracle which Chriſt performed at Bethany by reſtoring a perſon to life who had lain ſome days in the grave, introduces his narrative by emphatically obſerving, that 'Jeſus loved Lazarus;' intimating, it ſhould ſeem, that the ſentiments which Chriſt entertained of Lazarus were a diſtinct and peculiar ſpecies of that general benevolence with which he was actuated towards all mankind. Agreeably to this explication of the ſacred hiſtorian's meaning, when the ſiſters of Lazarus ſent to acquaint Jeſus with the ſtate in which their brother lay, they did not even mention his name; but, pointing him out by a more honourable and equally notorious deſignation, the terms of their meſſage were, 'Behold! he whom thou loveſt is ſick!' Accordingly, when he informs his diſciples of the notice he had thus received, his expreſſion is, 'Our friend Lazarus ſleepeth.' Now that Chriſt did not upon this occaſion uſe the word *friend* in its looſe undiſtinguiſhed acceptation, but in a reſtrained and ſtrictly appropriated ſenſe, is not only manifeſt from this plain account of the fact itſelf, but appears farther evident from the ſequel. For as he was advancing to the grave, accompanied with the relations of the deceaſed, he diſcovered the ſame emotions of grief as ſwelled the boſoms of thoſe with whom Lazarus had been moſt intimately connected; and ſympathizing with their common ſorrow, he melted into tears. This circumſtance was too remarkable to eſcape particular obſervation: and it drew from the ſpectators, what one ſhould think it muſt neceſſarily draw from every reader, this natural and obvious reflection, 'Behold! how he loved him!'

"But in the concluding cataſtrophe of our Saviour's life, he gave a ſtill more deciſive proof that ſentiments of the ſtrongeſt perſonal attachment and friendſhip were not unworthy of being admitted into his ſacred boſom: they were too deeply, indeed, impreſſed, to be extinguiſhed even by the moſt excruciating torments. In thoſe dreadful moments, obſerving among the afflicted witneſſes of his painful and ignominious ſufferings, that faithful follower who is deſcribed by the hiſtorian as 'the diſciple whom he loved;' he diſtinguiſhed him by the moſt convincing inſtance of ſuperior confidence, eſteem, and affection, that ever was exhibited to the admiration of mankind. For, under circumſtances of the moſt agonizing torments, when it might be thought impoſſible for human nature to retain any other ſenſibility but that of its own inexpreſſible ſufferings, he recommended to the care and protection of this his tried and approved friend, in terms of peculiar regard and endearment, the moſt tender and ſacred object of his private affections. But no language can repreſent this pathetic and affecting ſcene with a force and energy equal to the ſublime ſimplicity of the Evangeliſt's own narrative: 'Now there ſtood by the croſs of Jeſus, his mother and his mother's ſiſter, and Mary Magdalene. When Jeſus ſaw his mother and the diſciple (ſtanding) by, whom he loved; he ſaith to his mother, Behold thy ſon! then he ſaith to the diſciple, Behold thy mother! And from that hour that diſciple took her to his own home.'

"It may ſafely be aſſerted, that among all thoſe memorable examples of friendſhip, which have been celebrated with the higheſt encomiums by the ancients, there cannot be produced a ſingle inſtance in which the moſt diſtinguiſhed features of exalted amity are ſo ſtrongly diſplayed as in the foregoing relation. The only one, perhaps, that bears even a faint ſimilitude to it, is that famous tranſaction recorded by a Greek author, which paſſed between Eudamidas and Aretheus. But when the very different circumſtances attending the reſpective examples are duly conſidered, it muſt be acknowledged, that the former riſes as much above the latter in the proof it exhibits of ſublime friendſhip, as it does in the dignity of the characters concerned.

"Upon the whole, then, it appears, that the divine Founder of the Chriſtian religion, as well by his own example as by the ſpirit of his moral doctrine, has not only encouraged but conſecrated friendſhip."

FRIESLAND, one of the united provinces of the Low Countries. It is bounded on the eaſt by the river Lauvers, which parts it from the lordſhip of Groningen, on the ſouth by Overyſſel, on the weſt by the Zuider-Zee, and on the north by the German ocean. It is 30 miles from north to ſouth, and 28 from eaſt to weſt. The land is very fertile in corn and paſture;

Friesland
ll
Fright.

ſture; the horſes are large, and the cows and ſheep prolific. It is divided into three parts; Weſtergo to the weſt, Oſtergo to the eaſt, and Sevenwalden to the ſouth. The iſlands of Sheling, Ameland, and other ſmall ones, are dependent on this province. The principal towns are Leuwarden the capital, Franeker, Dockum, Harlingen, and Staveren.

FRIESLAND, Eaſt, a province of Germany, in the circle of Weſtphalia, lying near the German ocean. It is bounded on the ſouth by the biſhopric of Munſter, on the eaſt by the country of Oldenburgh, on the weſt by the province of Groningen, and on the north by the ſea, being about 50 miles in length, and 30 in breadth. It belongs to Pruſſia, and was formerly called the *county of Embden*. It is a very fertile country, and feeds a great number of cattle; but it was greatly damaged by an inundation in 1717, and the repair of the dykes coſt an immenſe ſum. The principal towns are Norden, Leer, Eſſens, Whitmunde, and Aurick. Embden was an imperial city, and the principal place in the country; but now belongs alſo to the king of Pruſſia, who bought it of the Dutch.

FRIGATE, in naval affairs, a ſhip of war uſually of two decks, light built, deſigned for ſwift ſailing. When it hath but one deck, and conſequently is of a ſmaller ſize, they call her a light frigate.

Frigates mount from 20 to 44 guns, and are eſteemed excellent cruiſers. The name was formerly known only in the Mediterranean, and applied to a long kind of veſſel navigated in that ſea with ſails and oars. The Engliſh were the firſt who appeared on the ocean with theſe ſhips, and equipped them for war as well as for commerce.

FRIGATE-Built, denotes the diſpoſition of the decks of ſuch merchant ſhips as have a deſcent of four or five ſteps from the quarter-deck and forecaſtle into the waiſt, in contradiſtinction to thoſe whoſe decks are on a continued line for the whole length of the ſhip, which are called *galley-built*.

FRIGATOON, a Venetian veſſel, commonly uſed in the Adriatic, built with a ſquare ſtern, and without any foremaſt, having only a mainmaſt, mizenmaſt, and bowſprit.

FRIGHT, or TERROR, a ſudden and violent degree of fear. See FEAR.

Sudden fear is frequently productive of very remarkable effects upon the human ſyſtem. Of this many inſtances occur in medical writings.—In general, the effects of terror are a contraction of the ſmall veſſels and a repulſion of the blood in the large and internal ones; hence proceed a ſuppreſſion of perſpiration, a general oppreſſion, trembling, and anguiſh of the heart, and lungs overcharged with blood.

Frights often occaſion incurable diſeaſes, as epilepſy, ſtupor, madneſs, &c. In acute diſeaſes, they have evidently killed many, by the agitation into which they have thrown the ſpirits, already too much diſordered. We have alſo accounts of perſons abſolutely killed by terrors when in perfect health at the time of receiving the ſhock from them: people ordered to be executed, but with private orders for a reprieve, have expired at the block without a wound.—Out of many inſtances of the fatal effects of fear recorded in writers, the following is ſelected as one of the moſt ſingular. "George Grochantzy, a Polander, who had inliſted as a ſoldier in the ſervice of the king of Pruſſia, deſerted during the war. A ſmall party was ſent in purſuit of him; and when he leaſt expected it, they ſurpriſed him ſinging and dancing among a company of peaſants, who were got together in an inn and were making merry. This event, ſo ſudden and unforeſeen, and at the ſame time ſo dreadful in its conſequences, ſtruck him in ſuch a manner, that, giving a great cry, he became at once altogether ſtupid and inſenſible, and was ſeized without the leaſt reſiſtance. They carried him away to Glocau, where he was brought before the council of war, and received ſentence as a deſerter. He ſuffered himſelf to be led and diſpoſed of at the will of thoſe about him, without uttering a word, or giving the leaſt ſign that he knew what had happened or would happen to him. He remained immoveable as a ſtatue wherever he was placed, and was wholly paſſive with reſpect to all that was done to him or about him. During all the time that he was in cuſtody, he neither ate, nor drank, nor ſlept, nor had any evacuation. Some of his comrades were ſent to ſee him; after that he was viſited by ſome officers of his corps, and by ſome prieſts; but he ſtill continued in the ſame ſtate, without diſcovering the leaſt ſigns of ſenſibility. Promiſes, intreaties, and threatenings were equally ineffectual. The phyſicians who were conſulted upon his caſe, were of opinion, that he was in a ſtate of hopeleſs idiocy. It was at firſt ſuſpected, that thoſe appearances were feigned; but theſe ſuſpicions neceſſarily gave way, when it was known that he took no ſuſtenance, and that the involuntary functions of nature were in great meaſure ſuſpended. After ſome time they knocked off his fetters, and left him at liberty to go whither he would. He received his liberty with the ſame inſenſibility that he had ſhowed upon other occaſions: he remained fixed and immoveable; his eyes turned wildly here and there without taking cognizance of any object, and the muſcles of his face were fallen and fixed like thoſe of a dead body. Being left to himſelf, he paſſed 20 days in this condition, without eating, drinking, or any evacuation, and died on the 20th day. He had been ſometimes heard to fetch deep ſighs; and once he ruſhed with great violence on a ſoldier, who had a mug of liquor in his hand, forced the mug from him, and having drank the liquor with great eagerneſs, let the mug drop to the ground."

Fright.

When a perſon is affected with terror, the principal endeavour ſhould be to reſtore the circulation to its due order, to promote perſpiration, and to allay the agitation of the patient. For theſe purpoſes he may drink a little warm liquor, as camomile tea, &c. the feet and legs may be put into warm water, the legs rubbed, and the camomile tea repeated every ſix or eight minutes; and when the ſkin is warm, and there is a tendency to perſpiration, ſleep may be promoted by a gentle opiate.

But frights have been known not only to cauſe, but alſo to cure, diſeaſes. Mr Boyle * mentions agues, gout, and ſciatica, cured by this means.

* *Works*, *Abr.* p. 8 &c.

To turn from the ſerious to the ludicrous effects of fear, the following inſtance of the latter ſort, quoted from a French author by Mr Andrews in his volume of Anecdotes, ſhows upon what ſlight occaſions this paſſion may be ſometimes excited in a very high degree, even in perſons the moſt unlikely to entertain

Fright ‖ Frilazin.

tain such a guest. "Charles Gustavus (the successor of Christina of Sweden) was besieging Prague, when a boor of most extraordinary visage desired admittance to his tent; and being allowed entrance, offered, by way of amusing the king, to devour a whole hog of one hundred weight in his presence. The old general Konigsmarc, who stood by the king's side, and who, soldier as he was, had not got rid of the prejudices of his childhood, hinted to his royal master that the peasant ought to be burnt as a sorcerer. 'Sir,' said the fellow, irritated at the remark, 'if your majesty will make but that old gentleman take off his sword and his spurs, I will eat him immediately before I begin the hog.' General Konigsmarc (who had, at the head of a body of Swedes, performed wonders against the Austrians, and who was looked upon as one of the bravest men of the age) could not stand this proposal, especially as it was accompanied by a most hideous and preternatural expansion of the frightful peasant's jaws. Without uttering a word, the veteran suddenly turned round, ran out of the court, and thought not himself safe until he had arrived at his quarters; where he remained above twenty-four hours locked up securely, before he had got rid of the panic which had so severely affected him."

† ments of Moral Science.

Fear (Dr Beattie† observes) should not rise higher than to make us attentive and cautious; when it gains an ascendancy in the mind, it becomes an insupportable tyranny, and renders life a burden. The object of fear is evil; and to be exempt from fear, or at least not enslaved to it, gives dignity to our nature, and invigorates all our faculties. Yet there are evils which we ought to fear. Those that arise from ourselves, or which it is in our power to prevent, it would be madness to despise, and audacity not to guard against. External evils, which we cannot prevent, or could not avoid without a breach of duty, it is manly and honourable to bear with fortitude. Insensibility to danger is not fortitude, no more than the incapacity of feeling pain can be called patience; and to expose ourselves unnecessarily to evil is worse than folly, and very blameable presumption. It is commonly called *fool-hardiness*; that is, such a degree of hardiness or boldness as none but fools are capable of. See the article FORTITUDE.

FRIGID (*frigidus*), in a general sense, denotes the quality of being cold. It is frequently applied to a jejune style, that is unanimated by any ornaments, and consequently without any force or vigour.

FRIGID-zone. See ZONE, GEOGRAPHY *Index*.

FRIGIDITY, in *Medicine*, the same with IMPOTENCE.

FRIGORIFIC, in *Physiology*, small particles of matter, which, according to Gassendus and others, being actually and essentially cold, and penetrating other bodies, produce in them that quality which is called *cold*, or, according to others, merely the absence or diminution of the particles of heat. See COLD, CHEMISTRY *Index*, and SALTS.

FRILAZIN, the name of a class or rank of people among the Anglo-Saxons, consisting of those who had been slaves, but had either purchased, or by some other means obtained, their liberty. Though these were in reality free men, they were not considered as of the same rank and dignity with those who had been born free, but were still in a more ignoble and dependent condition, either on their former masters or on some new patrons. This custom the Anglo-Saxons seem to have derived from their ancestors in Germany, among whom those who had been made free did not differ much in point of dignity or importance in the state from those who continued in servitude. This distinction between those who had been made free and those who enjoy freedom by descent from a long race of free men, still prevails in many parts of Germany; and particularly in the original seats of the Anglo-Saxons. Many of the inhabitants of towns and cities in England, in this period, seem to have been of this class of men, who were in a kind of middle state between slaves and freemen.

Frilazin ‖ Frit.

FRILL, in *Falconry*. When a hawk trembles or shivers, they say she frills.

FRINGILLA, a genus of birds belonging to the order of passeres. See ORNITHOLOGY *Index*.

FRIO, a small island on the coast of the Brasils, situated in 32° 2′ S. Lat. and 41° 31′ 45″ W. Long. The land of Frio is high, with a hollow in the middle, which gives it, at a distance, the appearance of two separate islands. The passage between the island and the continent is about a mile broad, and seemed to Sir Erasmus Gower to be clear from shoals.

FRIPPERY, a French term sometimes used in our language to signify the trade or traffic of old second-hand clothes and goods. The word is also used for the place where such sort of commerce is carried on, and even for the commodities themselves. The company of frippiers, or fripperers, at Paris, are a regular corporation, of an ancient standing, and make a considerable figure in that city.

FRISII, FRISEI, FRISIONES, and FRISONES, in *Ancient Geography*, a people of Germany, so called either from their ardent love of freedom, or from the fresh and unbroken lands they occupied, contradistinguished from the old lands. Tacitus divides them, from their extent of power and territory, into the Majores, situated on the coasts between the Rhine and the Ems; and into the Minores, occupying the parts about the lakes lying between the channels of the Rhine.

FRIT, or FRITT, in the glass manufacture, is the matter or ingredients whereof glass is to be made, when they have been calcined or baked in a furnace.

A salt drawn from the ashes of the plant kali, or from fern or other plants, mixed with sand or flint, and baked together, makes an opaque mass called by glasmen *frit*; probably from the Italian *frittare*, to fry; or because the frit, when melted, runs into lumps, like fritters, called by the Italians *fritelli*.

Frit, by the ancients, was called *ammonitrum*, of *αμμος*, *sand*, and *νιτρον*, *nitre*; under which name it is described by Pliny thus: Fine sand from the Volturnian sea, mixed with three times the quantity of nitre, and melted, makes a mass called *ammonitrum*; which being rebaked makes pure glass.

Frit, Neri observes, is only the calx of the materials which make glass; which, though they might be melted, and glass be made, without thus calcining them, yet it would take up much more time. This calcining, or making of frit, serves to mix and incorporate the materials

Frit ‖ Frizing.

terials together, and to evaporate all the ſuperfluous humidity. The frit, once made, is readily fuſed, and turned into glaſs.

There are three kinds of frits. The firſt, cryſtal frit, or that for cryſtal metal, is made with ſalt of pulverine and ſand. The ſecond, and ordinary frit, is made of the bare aſhes of pulverine or barilla, without extracting the ſalt from them. This makes the ordinary white or cryſtal metal. The third is frit for green glaſſes, made of common aſhes, without any preparation. This laſt frit will require ten or twelve hours baking.

The materials in each are to be finely powdered, waſhed, and ſearced; then equally mixed, and frequently ſtirred together in the melting pot. See GLASS.

FRITILLARIA, FRITILLARY; a genus of plants belonging to the hexandria claſs; and in the natural method ranking under the 10th order, *Coronariæ*. See BOTANY *Index*.

The different ſpecies of fritillary were, according to Beckman, introduced into gardens about the middle of the 16th century. The crown imperial (*fritillaria imperialis*) is ſuppoſed by ſome to be the lily which is much celebrated in ſacred ſcripture; becauſe a figure reſembling this ſplendid plant, they imagine, is found repreſented on the coins of Herod. Invent. vol. iii.

FRIULI, a province of Italy, ſubject to Venice, and bounded by Carinthia in Germany on the north, by Carniola on the eaſt, by the gulf of Venice on the ſouth, and by the Belluneſe and Feltrin on the weſt.

FRIZE, or FRIEZE, in *Architecture*, a part of the entablature of columns, more uſually written and pronounced *freeze*. See FREEZE.

FRIZE, or FREEZE, in *Commerce*, a kind of woollen cloth or ſtuff for winter wear, being frized or knapt on one ſide; whence, in all probability, it derives its name.

Of frizes, ſome are croſſed, others not croſſed; the former are chiefly of Engliſh manufacture, the latter of Iriſh.

FRIZING of CLOTH, a term in the woollen manufactory, applied to the forming of the nap of cloth or ſtuff into a number of little hard burrs or prominences, covering almoſt the whole ground thereof.

Some cloths are only frized on the back ſide, as black cloths; others on the right ſide, as coloured and mixed cloths, rateens, bays, freezes, &c.

Frizing may be performed two ways. One with the hand, that is, by means of two workmen, who conduct a kind of plank that ſerves for a frizing inſtrument. The other is by a mill, worked either by water, or a horſe, or ſometimes by men. This latter is eſteemed the better way of frizing, by reaſon the motion being uniform and regular, the little knobs of the frizing are formed more equably and regularly. The ſtructure of this uſeful machine is as follows:

The three principal parts are the frizer or criſper, the frizing table, and the drawer or beam. The two firſt are two equal planks or boards, each about 10 feet long and 15 inches broad; differing only in this, that the frizing-table is lined or covered with a kind of coarſe woollen ſtuff, of a rough ſturdy nap; and the frizer is incruſtated with a kind of cement compoſed of glue, gum arabic, and a yellow ſand, with a little aqua-vitæ, or urine. The beam or drawer, thus called, becauſe it draws the ſtuff from between the frizer and the frizing table, is a wooden roller, beſet all over with little, fine, ſhort points or ends of wire, like thoſe of cards uſed in carding of wool.

Frizing ‖ Frobiſher.

The diſpoſition and uſe of the machine is thus: The table ſtands immoveable, and bears or ſuſtains the cloth to be frized, which is laid with that ſide uppermoſt on which the nap is to be raiſed; over the table is placed the frizer, at ſuch a diſtance from it as to give room for the ſtuff to be paſſed between them: ſo that the frizer, having a very ſlow ſemicircular motion, meeting the long hairs or naps of the cloth, twiſts and rolls them into little knobs or burrs; while at the ſame time, the drawer, which is continually turning, draws away the ſtuff from under the frizer, and winds it over its own points.

All that the workman has to do while the machine is a-going, is to ſtretch the ſtuff on the table as faſt as the drawer takes it off, and from time to time to take off the ſtuff from the points of the drawer.

The deſign of having the frizing table lined with ſtuff of a ſhort, ſtiff, ſtubby nap, is that it may detain the cloth between the table and the frizer long enough for the grain to be formed, that the drawer may not take it away too readily, which muſt otherwiſe be the caſe, as it is not held by any thing at the other end. It were unneceſſary to ſay any thing particular of the manner of frizing ſtuffs with the hand, it being the aim of the workmen to imitate, as near as they can with their wooden inſtrument, the ſlow, equable, and circular motion of the machine: it needs only be added, that their frizer is but about two feet long and one broad; and that to form the nap more eaſily, they moiſten the ſurface of the ſtuff lightly, with water mingled with whites of eggs or honey.

FROBENIUS, JOHN, a famous and learned printer in the 16th century, was born at Hamelburgh in Franconia, and ſettled at Baſil. He had before ſtudied in that univerſity, where he acquired the reputation of being uncommonly learned; and now ſetting up a printing houſe in that city, was the firſt of the German printers who brought that admirable art to any degree of perfection. Being a man of great probity and piety, as well as ſkill, he was particularly choice in the authors he printed; and would never, for the ſake of profit, ſuffer libels, or any thing that might hurt the reputation of another, to go through his preſs. The great character of this printer was the principal motive which induced Eraſmus to reſide at Baſil, in order to have his own works printed by him. A great number of valuable authors were printed by Frobenius, with great care and accuracy; among which were the works of St Jerome, Auguſtine, and Eraſmus. He deſigned to have printed the Greek Fathers; but died in 1527, before he could execute his deſign. Eraſmus wrote his epitaph in Greek and Latin.

John Frobenius left a ſon named *Jerome Frobenius*, and a daughter married to Nicholas Epiſcopius; who, joining in partnerſhip, continued Frobenius's printing houſe with reputation, and printed correct editions of the Greek Fathers.

FROBISHER, or FORBISHER, SIR MARTIN, an excellent navigator and ſea officer in the 16th century, was born near Doncaſter in Yorkſhire, and was from his

Frobisher || Frog Fish.

his youth brought up to navigation. He was the first Englishman who attempted to find a north-west passage to China, and in 1576 he sailed with two barks and a pinnace in order to attempt that passage. In this voyage he discovered a cape, to which he gave the name of *Queen Elizabeth's Foreland*, and the next day discovered a strait to which he gave his own name. This voyage proving unsuccessful, he attempted the same passage in 1577; but discovering some ore in an island, and his commission directing him in this voyage only to search for ore, and to leave the farther discovery of the north-west to another time, he returned to England. He sailed again, with 15 ships and a great number of adventurers, to form a settlement: but being obstructed by the ice, and driven out to sea by a violent storm, they, after encountering many difficulties, returned home, without making any settlement, but brought a large quantity of ore.—He afterwards commanded the Aid in Sir Francis Drake's expedition to the West Indies, in which St Domingo in Hispaniola, Carthagena, and Santa Justina, in Florida, were taken and sacked. In 1588, he bravely exerted himself in defence of his country against the Spanish armada, when he commanded the Triumph, one of the largest ships in that service; and, as a reward for his distinguished bravery, received the honour of knighthood from the lord high admiral at sea. He afterwards commanded a squadron which was ordered to cruise on the Spanish coast; and, in 1592, took two valuable ships and a rich carrack. In 1594 he was sent to the assistance of Henry IV. king of France against a body of the Leaguers and Spaniards, who had strongly entrenched themselves at Croyzon near Brest; but in an assault upon that fort, on the 7th of November, Sir Martin was unfortunately wounded with a ball, of which he died soon after he had brought back the fleet to Plymouth, and was buried in that town.

Frobisher's Straits, lie a little to the northward of Cape Farewell in West Greenland, and were discovered by Sir Martin Frobisher. W. Long. 48. 16. N. Lat. 63. 12.

FRODSHAM, a town of Cheshire in England, 162 miles from London, is noted for its ancient castle. It has a stone bridge over the river Weaver near its conflux with the Mersey, and a harbour for ships of good burden. By means of inland navigation, it has communication with the rivers Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancaster, Westmoreland, Stafford, Warwick, Leicester, Oxford, Worcester, &c.

FROG. See RANA, } ERPETOLOGY *Index*.
Bull FROG. See RANA, }

Frog Fish of Surinam, a very singular animal, of which a figure is given by Mr Edwards, *Hist. of Birds*, vol. i. There is no specimen in the British museum, nor in any private collection, except that of Dr Fothergill. It was brought from Surinam in South America.—Frogs, both in Asia and Africa, according to Merian, change gradually from fishes, to frogs, as those in Europe; but after many years revert again into fishes, though the manner of their change has never been investigated. In Surinam these fishes are called *jakjés*. They are cartilaginous, of a substance like our mustela, and exquisite food: they are formed with regular vertebræ, and small bones all over the body divided into equal parts; are first darkish, and then gray: their scales make a beautiful appearance. Whether this animal is, in its perfect state, a species of frog with a tail, or a kind of water lizard, Mr Edwards does not pretend to determine; but observes, that when its size is considered, if it should be deemed a tadpole at first produced from spawn, and in its progress towards a frog, such an animal, when full grown, if it bears the same proportion to its tadpole as those in Europe do, must be of enormous size; for our full grown frogs exceed the tadpoles at least 50 times. See ERPETOLOGY *Index*.

Frog Fish || Frondescentia.

FROME, a river that rises from several springs in the western parts of Dorsetshire in England, the principal of which is near Evershot; and directing its course almost due west, passes under Frampton bridge, washes the town of Dorchester, and falls into a bay of the English channel called *Poolhaven*, near Wareham.

FROME Selwood, a town of Somersetshire in England, 150 miles from London. It is the chief town of this part of the country, which was anciently one great forest called *Selwoodshire*; and in the latter end of the last century, in those called *Frome Woodlands*, there was a considerable gang of money coiners or clippers, of whom many were taken and executed, and their covert laid open. Though the town is bigger than some cities, yet it has only one church; but it has six or seven meeting houses of Protestant dissenters. The inhabitants are reckoned about 13,000, whose chief manufactory is broad cloth. About 50 years ago, more wire cards for carding the wool for the spinners were made at this place than in all England besides, which was for the most part supplied with them from hence; for here were no less than 20 master cardmakers, one of whom employed 400 men, women, and children, in that manufactory, at one time; so that even children of 7 or 8 years of age could earn half-a-crown a-week. The river here which abounds with trout, eels, &c. rises in the woodlands; and runs under its stone bridge towards Bath, on the east side of which it falls into the Avon. This town has been a long time noted for its fine beer, which they keep to a great age, and is generally preferred by the gentry to the wines of France and Portugal. It was governed formerly by a bailiff, and now by two constables of the hundreds of Frome, chosen at the court leet of the lord of the manor.

FRONDESCENTIA, from *frons*, "a leaf;" the precise time of the year and month in which each species of plants unfolds its first leaves.

All plants produce new leaves every year; but all do not renew them at the same time. Among woody plants, the elder, and most of the honeysuckles; among perennial herbs, the crocus and tulip, are the first that push or expand their leaves. The time of sowing the seeds decides with respect to annuals. The oak and ash are constantly the latest in pushing their leaves: the greatest number unfold them in spring; the mosses and firs in winter. These striking differences with respect to so capital a circumstance in plants as that of unfolding their leaves, seem to indicate that each species of plants has a temperature proper or peculiar to itself, and requires a certain degree of heat

to

Frondescentia || Frontinus.

to extricate the leaves from their buds, and produce the appearance in queſtion.

This temperature, however, is not ſo fixed or conſtant as it may appear to a ſuperficial obſerver. Among plants of the ſame ſpecies, there are ſome more early than others; whether that circumſtance depends, as it moſt commonly does, on the nature of the plants, or is owing to differences in heat, expoſure, and ſoil. In general, it may be affirmed, that ſmall and young trees are always earlier than larger or old ones.

The puſhing of the leaves is likewiſe accelerated or retarded according to the temperature of the ſeaſon; that is, according as the ſun is ſooner or later in diſpenſing that certain degree of heat which is ſuitable to each ſpecies.

FRONT, the forehead, or that part of the face above the eyebrows. The word is formed of the Latin *frons;* and that from the Greek φρονεῖν, "to think, perceive;" of φρὴν, *mens*, "the mind, thought." Martinius, to make out this etymology, obſerves, that from the forehead of a perſon we perceive what he is, what he is capable of, and what he thinks of.

FRONT is alſo uſed where ſeveral perſons or things are ranged ſide by ſide, and ſhow their front or fore parts.

FRONT, in *Architecture*, denotes the principal face or ſide of a building, or that preſented to their chief aſpect or view.

FRONTAL, in *Architecture*, a little fronton or pediment, ſometimes placed over a ſmall door or window.

FRONTAL, *Frontlet*, or *Brow-band*, is alſo uſed in ſpeaking of the Jewiſh ceremonies. This frontal conſiſts of four ſeveral pieces of vellum, on each whereof is written ſome text of ſcripture. They are all laid on a piece of a black calf's leather with thongs to tie it by. The Jews apply the leather with the vellum on their foreheads in the ſynagogue, and tie it round the head with the thongs.

FRONTIER, the border, confine, or extreme, of a kingdom or province, which the enemies find in front when they would enter the ſame. Thus we ſay, a frontier town, frontier province, &c. Frontiers were anciently called *marches*.

The word is derived from the French *frontiere*, and that from the Latin *frontaria;* as being a kind of front oppoſed to the enemy. Skinner derives *frontier* from *front;* inaſmuch as the frontier is the exterior and moſt advanced part of a ſtate, as the front is that of the face of a man.

FRONTIGNIAC WINE, is ſo called from a town of Languedoc in France, ſituated 16 miles ſouth-weſt of Montpelier, remarkable for producing it.

FRONTINAC, a fortreſs in Canada, ſituated at the head of a fine harbour, on the north-weſt ſide of the outlet of Lake Ontario, where veſſels of every deſcription may ride in perfect ſafety. It is 300 miles from Quebec, and in compariſon of that place has a very ſhort winter.

FRONTINUS, SEXTUS JULIUS, an ancient Roman writer, was of conſular dignity, and flouriſhed under the emperors Veſpaſian, Titus, Domitian, Nerva, and Trajan. He commanded the Roman armies in Britain; was made city prætor when Veſpaſian and Titus were conſuls; and Nerva made him curator of the aqueducts, which occaſioned his writing *De Aquæductibus urbis Romæ*. He wrote four books upon the Greek and Roman art of war; a piece *De Re Agraria*, and another *De Limitibus*. Theſe have been often ſeparately reprinted; but were all collected together in a neat edition at Amſterdam in 1661, with notes by Robertus Keuchenius. He died under Trajan. Frontinus || Froſt.

FRONTISPIECE, in *Architecture*, the principal face of a fine building. The word is formed of the Latin *frontiſpicium*, q. d. *frontis hominis inſpectio*. Hence alſo, by a figure, we ſay, the frontiſpiece of a book; meaning an ornament with an engraven title on the firſt page.

FRONTLET. See FRONTAL.

FRONTO, MARCUS CORNELIUS, was choſen for his eloquence to inſtruct the emperors Marcus Aurelius and Lucius Verus in rhetoric; in recompenſe of which he was promoted to the conſulate, and a ſtatue was erected to his honour. He taught Marcus Aurelius not only eloquence, but the duty of kings, and excellent morals. Some ſay he wrote againſt the Chriſtians. A ſect was formed of thoſe who looked upon him as a model of perfect eloquence, and thoſe were called *Frontoniani*. The Civilians, whoſe names were *Fronto*, mentioned in the Pandects, were probably deſcended from him.

FROST, in *Phyſiology*, ſuch a ſtate of the atmoſphere as occaſions the congelation or freezing of water and other fluids. See COLD, CHEMISTRY *Index*, and METEOROLOGY *Index*.

Water and other fluids are capable of containing the element of fire or heat in two very different ſtates. In the one, they ſeem to imbibe the fire in ſuch a manner, that it eludes all the methods by which we are accuſtomed to obſerve it, either by our ſenſation of feeling, or the thermometer; in the other, it manifeſts itſelf obviouſly to our ſenſes, either by the touch, the thermometer, or the emiſſion of light.

In the firſt of theſe ſtates, we call the body *cold;* and are apt to ſay that this coldneſs is occaſioned by the *abſence* of heat. But this manner of expreſſing ourſelves, excepting in a relative degree, is certainly improper; for even thoſe fluids which are coldeſt to the touch contain a vaſt deal of heat. Thus vapour, which is colder to the touch than the water from which it was raiſed, contains an immenſe quantity of fire, even more than ſufficient to heat it red hot. The like may be ſaid of common ſalt, and ſnow, or ice. If a quantity of each of theſe ſubſtances is ſeparately reduced to the degree of 28 or 30 of Fahrenheit's thermometer, upon mixing them together, the heat which would have raiſed the thermometer to the degree above mentioned, now enters into the ſubſtance of them in ſuch a manner that the mercury falls down to 0.—Here an exceſſive degree of cold is produced, and yet we are ſure that the ſubſtances contain the very ſame quantity of heat that they formerly did: nay, they will even ſeem exceedingly cold, when they muſt certainly contain a great deal more heat than they originally did; for they abſorb it from all bodies around them; and if a ſmall veſſel full of water is put into the middle of ſuch a mixture, it will in a ſhort time be full of ice.

It appears, therefore, that our ſenſes, even when aſſiſted by thermometers, can only judge of the ſtate in which the element of fire is with relation to the bo-

dies

Froſt. dies around us, without regard to the quantity contained in them. Thus, if heat flows from any part of our body into any ſubſtance actually in contact with it, the ſenſation of cold is excited, and we call that ſubſtance *cold;* but if it flows from any ſubſtance into our body, the ſenſation of heat is excited, and we call that ſubſtance *hot*, without regard to the abſolute quantity contained in either caſe.

Of all known ſubſtances, the atmoſphere either abſorbs or throws out heat with the moſt remarkable facility: and in one or other of theſe ſtates it always is with reſpect to the ſurface of the earth, and ſuch bodies as are placed on or near it; for theſe, properly ſpeaking, have no temperature of their own, but are entirely regulated by that of the atmoſphere.—When the air has been for ſome time abſorbing the heat from terreſtrial bodies, a froſt muſt be the undoubted conſequence, for the ſame reaſon that water freezes in a veſſel put into a freezing mixture; and were this abſorption to continue for a length of time, the whole earth would be converted into a frozen maſs. There are, however, certain powers in nature, by which this effect is always prevented; and the moſt violent froſt we can imagine, muſt always as it were defeat its own purpoſes, and end in a thaw. To underſtand this ſubject, we muſt obſerve,

1. In that ſtate of the atmoſphere which we denominate froſt, there is a moſt intimate union between the air and the water it contains; and therefore froſty weather, except in very high latitudes, is generally clear.

2. When ſuch a union takes place, either in winter or ſummer, we obſerve the atmoſphere alſo inclined to abſorb heat, and conſequently to froſt. Thus in clear ſettled weather, even in ſummer, though the day may be exceſſively hot by reaſon of the continued ſunſhine, yet the mornings and evenings are remarkably cold, and ſometimes even diſagreeably ſo.

3. The air being therefore always ready in the time of froſt or in clear weather, to abſorb heat from every ſubſtance which comes into contact with it, it follows that it muſt alſo abſorb part of that which belongs to the vapours contained in it.

4. Though vapour is capable of becoming much colder than water without being frozen, yet by a continued abſorption it muſt at laſt part with its latent heat, i. e. that which eſſentially conſtitutes its vapour, and without which it is no longer vapour, but water or ice. No ſooner, therefore, does the froſt arrive at a certain pitch, than the vapours, everywhere diſperſed through the air, give out their latent heat: the atmoſphere then becomes clouded: the froſt either totally goes off, or becomes milder by reaſon of the great quantity of heat diſcharged into the air; and the vapours deſcend in rain, hail, or ſnow, according to the particular diſpoſition of the atmoſphere at the time.

5. Even in the polar regions, where it may be thought that the froſt muſt increaſe beyond meaſure, there are alſo natural means for preventing its running to extremes. The principal cauſe here is, the mixture of a great quantity of vapours from the more temperate regions of the globe with the air in thoſe dreary climates. It is well known, that aqueous vapour always flies from a warm to a colder place. For this reaſon, the vapours raiſed by the ſun in the more temperate regions of the earth, muſt continually travel northward and ſouthward in great quantities. Thus they furniſh materials for thoſe immenſe quantities of ſnow and ice which are to be found in the neighbourhood of the poles, and which we cannot imagine the weak influence of the ſun in theſe parts capable of raiſing. It is impoſſible that a quantity of vapour can be mixed with froſty air, without communicating a great deal of heat to it; and thus there are often thaws of conſiderable duration even in thoſe climates where, from the little influence of the ſun, we ſhould ſuppoſe the froſt would be perpetual. Froſt.

6. We may now account with ſome probability for the uncertain duration of froſts. In this country they are ſeldom of a long continuance; becauſe the vapours raiſed from the ſea with which our iſland is ſurrounded, perpetually mix with the air over the iſland, and prevent a long duration of the froſt. For the ſame reaſon, froſts are never of ſuch long duration in maritime places on the continent as in the inland ones. There is nothing, however, more uncertain than the motion of the vapours with which the air is conſtantly filled; and therefore it is impoſſible to prognoſticate the duration of a froſt with any degree of certainty. In general, we may always be certain, that if a quantity of vapour is accumulated in any place, no intenſe froſt can ſubſiſt in that place for any length of time; and by whatever cauſes the vapours are driven from place to place, by the ſame cauſes the froſts are regulated throughout the whole world.

The effects of froſt in different countries are enumerated under the article CONGELATION. In the northern parts of the world even ſolid bodies are liable to be affected by froſt. Timber is often apparently frozen, and rendered exceedingly difficult to ſaw. Marl, chalk, and other leſs ſolid terreſtrial concretions will be ſhattered by ſtrong and durable froſts. Metals are contracted by froſt: thus, an iron tube, 12 feet long, upon being expoſed to the air in a froſty night, loſt two lines of its length. On the contrary, froſt ſwells or dilates water near one-tenth of its bulk. Mr Boyle made ſeveral experiments with metalline veſſels, exceedingly thick and ſtrong; which being filled with water, cloſe ſtopped, and expoſed to the cold, burſt by the expanſion of the frozen fluid within them. Trees are frequently deſtroyed by froſt, as if burnt up by the moſt exceſſive heat; and in very ſtrong froſts, walnut trees, aſhes, and even oaks, are ſometimes ſplit and cleft, ſo as to be ſeen through, and this with a terrible noiſe, like the exploſion of fire-arms.

Froſt naturally proceeds from the upper parts of bodies downwards: but how deep it will reach in earth or water, is not eaſily known; becauſe this depth may vary with the degree of coldneſs in the air, by a longer or ſhorter duration of the froſt, the texture of the earth, the nature of the juices wherewith it is impregnated, the conſtitution of its more internal parts as to heat and cold, the nature of its effluvia, &c. Mr Boyle, in order to aſcertain this depth, after four nights of hard froſt, dug in an orchard, where the ground was level and bare, and found the froſt had ſcarce reached three inches and a half, and in a garden nearer the houſe only two inches below the ſurface.

Nine-

Froſt. Nine or ten ſucceſſive froſty nights froze the bare ground in the garden ſix inches and a half deep; and in the orchard, where a wall ſheltered it from the ſouth ſun, to the depth of eight inches and a half. He alſo dug in an orchard, near a wall, about a week afterwards, and found the froſt to have penetrated to the depth of 14 inches. In a garden at Moſcow, the froſt in a hard ſeaſon only penetrates to two feet: and the utmoſt effect that Captain James mentions the cold to have had upon the ground of Charlton iſland, was to freeze it to 10 feet deep: whence may appear the different degrees of cold of that iſland and Ruſſia. And as to the freezing of water at the above-mentioned iſland, the Captain tells us it does not naturally congeal above the depth of ſix feet, the reſt being by accident. Water alſo, expoſed to the cold air in large veſſels, always freezes firſt at the upper ſurface, the ice gradually increaſing and thickening downwards: for which reaſon, frogs retire in froſty weather to the bottom of ditches; and it is ſaid, that ſhoals of fiſh retire in winter to thoſe depths of the ſea and rivers where they are not to be found in ſummer. Water, like the earth, ſeems not diſpoſed to receive any very intenſe degree of cold at a conſiderable depth or diſtance from the air. The vaſt maſſes of ice found in the northern ſeas being only many flakes and fragments, which, ſliding under each other, are, by the congelation of the intercepted water, cemented together.

In cold countries, the froſt often proves fatal to mankind; not only producing gangrenes, but even death itſelf. Thoſe who die of it have their hands and feet firſt ſeized, till they grow paſt feeling it; after which the reſt of their bodies is ſo invaded, that they are taken with a drowſineſs, which, if indulged, they awake no more, but die inſenſibly. But there is another way whereby it proves mortal, viz. by freezing the abdomen and viſcera, which on diſſection are found to be mortified and black.

The great power of froſt on vegetables is a thing ſufficiently known; but the differences between the froſts of a ſevere winter, and thoſe which happen in the ſpring mornings, in their effects on plants and trees, were never perfectly explained, till by Meſſ. Du Hamel and Buffon in the Memoirs of the Paris Academy.

The froſts of ſevere winters are much more terrible than thoſe of the ſpring, as they bring on a privation of all the products of the tenderer part of the vegetable world; but then they are not frequent, ſuch winters happening perhaps but once in an age; and the froſts of the ſpring are in reality greater injuries to us than theſe, as they are every year repeated.

In regard to trees, the great difference is this, that the froſts of ſevere winters affect even their wood, their trunks and large branches; whereas thoſe of the ſpring have only power to hurt the buds.

The winter froſts happening at a time when moſt of the trees in our woods and gardens have neither leaves, flowers, nor fruits upon them, and have their buds ſo hard as to be proof againſt ſlight injuries of weather, eſpecially if the preceding ſummer has not been too wet; in this ſtate, if there are no unlucky circumſtances attending, the generality of trees bear moderate winters very well; but hard froſts, which happen late in the winter, cauſe very great injuries even to thoſe trees which they do not utterly deſtroy. Theſe are, 1. Long cracks following the direction of the fibres. 2. Parcels of dead wood encloſed round with wood yet in a living ſtate. And, 3. That diſtemperature which the foreſters call the *double blea*, which is a perfect circle of blea, or ſoft white wood, which when the tree is afterwards felled, is found covered by a circle of hard and ſolid wood. Froſt.

The opinions of authors about the expoſition of trees to the different quarters, have been very different, and moſt of them grounded on no rational foundation. Many are of opinion that the effects of froſt are moſt violently felt on thoſe trees which are expoſed to the north; and others think the ſouth or the weſt the moſt ſtrongly affected by them. There is no doubt but the north expoſure is ſubject to the greateſt cold. It does not, however, follow from this, that the injury muſt be always greateſt on the trees expoſed to the north in froſts: on the contrary, there are abundant proofs that it is on the ſouth ſide that trees are generally more injured by froſt: and it is plain from repeated experiments, that there are particular accidents, under which a more moderate froſt may do more injury to vegetables, than the moſt ſevere one which happens to them under more favourable circumſtances.

It is plain from the accounts of the injuries trees received by the froſts in 1709, that the greateſt of all were owing to repeated falſe thaws, ſucceeded by repeated new froſts. But the froſts of the ſpring ſeaſon furniſh abundantly more numerous examples of this truth; and ſome experiments made by the Count de Buffon at large in his own woods, prove inconteſtably, that it is not the ſevereſt cold or moſt fixed froſt that does the greateſt injury to vegetables.

This is an obſervation directly oppoſite to the common opinion; yet is not the leſs true, nor is it in any way diſcordant to reaſon. We find by a number of experiments, that humidity is the thing that makes froſt fatal to vegetables; and therefore every thing that can occaſion humidity in them, expoſes them to theſe injuries, and every thing that can prevent or take off an over proportion of humidity in them, every thing that can dry them though with ever ſo increaſed a cold, muſt prevent or preſerve them from thoſe injuries. Numerous experiments and obſervations tend to prove this. It is well known that vegetables always feel the froſt very ſeverely in low places where there are fogs. The plants which ſtand by a river ſide are frequently found deſtroyed by the ſpring and autumnal froſts, while thoſe of the ſame ſpecies which ſtand in a drier place, ſuffer little or perhaps none at all by them; and the low and wet parts of foreſts are well known to produce worſe wood than the high and drier. The coppice wood in wet and low parts of common woods, though it puſh out more vigorouſly at firſt than that of other places, yet never comes to ſo good a growth; for the froſt of the ſpring killing theſe early top ſhoots, obliges the lower part of the trees to throw out lateral branches: and the ſame thing happens in a greater or leſſer degree to the coppice wood that grows under cover of larger trees in great foreſts; for here the vapours not being carried off either by the ſun or wind, ſtagnate and freeze, and in the ſame manner deſtroy the young ſhoots, as the fogs of marſhy places.

It

Froſt. It is a general obſervation alſo, that the froſt is never hurtful to the late ſhoots of the vine, or to the flower-buds of trees, except when it follows heavy dews, or a long rainy ſeaſon, and then it never fails to do great miſchief, though it be ever ſo ſlight.

The froſt is always obſerved to be more miſchievous in its conſequences on newly cultivated ground than in other places; and this is becauſe the vapours which continually ariſe from the earth, find an eaſier paſſage from thoſe places than from others. Trees alſo which have been newly cut, ſuffer more than others by the ſpring froſts, which is owing to their ſhooting out more vigorouſly.

Froſts alſo do more damage on light and ſandy grounds, than on the tougher and firmer ſoils, ſuppoſing both equally dry; and this ſeems partly owing to their being more early in their productions, and partly to their lax texture ſuffering a greater quantity of vapours to tranſpire.

It alſo has been frequently obſerved, that the ſide-ſhoots of trees are more ſubject to periſh by the ſpring froſts than thoſe from the top; and M. Buffon, who examined into this with great accuracy, always found the effects of the ſpring froſts much greater near the ground than elſewhere. The ſhoots within a foot of the ground quickly periſhed by them; thoſe which ſtood at two or three feet high, bore them much better; and thoſe at four feet and upwards frequently remained wholly unhurt; while the lower ones were entirely deſtroyed.

There is a ſeries of obſervations, which have proved beyond all doubt, that it is not the hard froſts which ſo much hurt plants, as thoſe froſts, though leſs ſevere, which happen when they are full of moiſture; and this clearly explains the account of all the great damages done by the ſevere froſts being on the ſouth ſide of the trees which are affected by them, though that ſide has been plainly all the while leſs cold than the north. Great damage is alſo done to the weſtern ſides of trees and plantations, when after a rain with a weſt wind the wind ſhifts to the north at ſunſet, as is frequently the caſe in ſpring, or when an eaſt wind blows upon a thick fog before ſunriſing.

Froſt, it is well known, is particularly deſtructive to the bloſſom of fruit trees. The following method of ſecuring ſuch trees from being damaged by early froſts may be acceptable to many of our readers. A rope is to be interwoven among the branches of the tree, and one end of it brought down ſo as to be immerſed in a bucket of water. The rope, it is ſaid, will act as a conductor, and convey the effects of the froſt from the tree to the water. This idea is not new, for the following paſſage may by found in Colerus. "If you dig a trench around the root of a tree, and fill it with water, or keep the roots moiſt till it has bloomed, it will not be injured by the froſt. Or, in ſpring, ſuſpend a veſſel filled with water from the tree. If you wiſh to preſerve the bloſſom from being hurt by the froſt, place a veſſel of water below it, and the froſt will fall into it."

Hoar FROST, a cold moiſt vapour, that is drawn up a little way into the air, and in the night falls again on the earth, when it is congealed into icy cryſtals of various figures. Hoar froſt, therefore, is nothing but dew turned into ice by the coldneſs of the air.

Melioration of Aromatic Spirits by FROST. Mr Beaume obſerves, that aromatic ſpirituous waters have leſs ſcent when newly diſtilled than after they have been kept about ſix months: and he found that the good effect of age was produced in a ſhort time by means of cold; and that, by plunging quart bottles of the liquor into a mixture of pounded ice and ſea ſalt, the ſpirit, after having ſuffered for ſix or eight hours the cold hence reſulting, proves as grateful as that which hath been kept many years. Simple waters alſo, after having been frozen, prove far more agreeable than they were before. Geoffroy takes notice of this melioration by froſt. *Hiſt. Acad.* 1713. Froſt || Frowde.

Melioration of Land by FROST. See AGRICULTURE *Index*.

FROTH a white light ſubſtance, formed on the ſurface of fluids by vehement agitation, conſiſting of air included in thin films of water.

Froth Spit, or *Cuckoo Spit*, a name given to a white froth, or ſpume, very common in the ſpring and firſt months of ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis or catchfly, thence called by ſome *ſpatling poppy*.

All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it till of late. It is formed by a little leaping animal, called by ſome the *flea graſhopper*, by applying its anus cloſe to the leaf, and diſcharging thereon a ſmall drop of a white viſcous fluid, which, containing ſome air in it, is ſoon elevated into a ſmall bubble: before this is well formed, it depoſits ſuch another drop; and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form the white froth which we ſee. Within this ſpume it is ſeen to acquire four tubercles on its back, wherein the wings are incloſed: theſe burſting, from a reptile it becomes a winged animal: and thus, rendered perfect, it flies to meet its mate, and propagate its kind. It has an oblong, obtuſe body, and a large head with ſmall eyes. The external wings (for it has four) are of a duſky brown colour, marked with two white ſpots: the head is black. It is a ſpecies of CICADA.

FROWDE, PHILIP, an Engliſh poet, was the ſon of a gentleman who had been poſtmaſter in the reign of Queen Anne. He was ſent to the univerſity of Oxford, where he had the honour of being diſtinguiſhed by Addiſon, who took him under his protection. While he remained there, he became the author of ſeveral pieces of poetry, ſome of which in Latin were pure and elegant enough to entitle them to a place in the *Muſæ Anglicanæ*. He likewiſe wrote two tragedies: The Fall of Saguntum, dedicated to Sir Robert Walpole; and Philotas, addreſſed to the earl of Cheſterfield. He died at his lodgings at Cecil Street in the Strand, in 1738; and in the London Daily Poſt had the following character given him: "Though the elegance of Mr Frowde's writings has recommended him to the general public eſteem, the politeneſs of his genius is the leaſt amiable part of his character; for he eſteemed the talents of wit and learning only as they were conducive to the excitement and practice of honour and humanity. Therefore, with a ſoul cheerful, benevolent, and virtuous, he was in converſation genteelly delightful, in friendſhip punctually ſincere, in death Chriſtianly reſigned. No man could live more beloved, no private man

Frowde || Fruit

man could die more lamented." A fine eloge! and we have no reaſon to doubt the truth of it.

FRUCTESCENTIA, (from *fructus*, "fruit,") comprehends the preciſe time in which, after the fall of the flowers, the fruits arrive at maturity, and diſperſe their ſeeds.

In general, plants which flower in ſpring, ripen their fruits in ſummer, as rye; thoſe which flower in ſummer have their fruits ripe in autumn, as the vine; the fruit of autumnal flowers ripens in winter, or the following ſpring, if kept in a ſtove or otherwiſe defended from exceſſive froſts. Theſe froſts, ſays M. Adanſon, are frequently ſo pernicious and violent as to deſtroy the greateſt part of the perennial plants of Virginia and Miſſiſſippi, that are cultivated in France, even before they have exhibited their fruit. The plants which flower during our winter, ſuch as thoſe of the Cape of Good Hope, ripen their fruit in ſpring in our ſtoves.

FRUCTIFEROUS, ſignifies properly any thing that produces fruit.

FRUCTIFICATION OF PLANTS, is defined by Linnæus to be the temporary part of a vegetable appropriated to generation, terminating the old vegetable, and beginning the new. It conſiſts of the following ſeven parts; viz. the calyx, corolla, ſtamen, piſtillum, pericarpium, ſemen or ſeed, and receptaculum. See BOTANY.

FRUIT, in its general ſenſe, includes whatever the earth produces for the nouriſhment and ſupport of animals; as herbs, grain, pulſe, hay, corn, and flax, every thing expreſſed by the Latins under the name *fruges*.

FRUIT, in *Natural Hiſtory*, denotes the laſt production of a tree or plant, for the propagation or multiplication of its kind; in which ſenſe fruit includes all kinds of ſeeds, with their furniture, &c.

FRUIT, in *Botany*, is properly that part of a plant wherein the ſeed is contained; called by the Latins *fructus*; and by the Greeks καρπος. The fruit in the Linnæan ſyſtem is one of the parts of fructification, and is diſtinguiſhed into three parts, viz. the pericarpium, ſeed, and receptacle, or *receptaculum ſeminum*. See BOTANY.

Colours extracted from FRUITS. See the article *COLOUR-Making*.

*Bread-*FRUIT. See ARTOCARPUS, BOTANY *Index*.

FRUITS, with regard to commerce, are diſtinguiſhed into *recent*, *freſh*, and *dry*.

Recent FRUITS are thoſe ſold juſt as they are gathered from the tree, without any farther preparation; as are moſt of the productions of our gardens and orchards, ſold by the fruiterers.

Dry FRUITS are thoſe dried in the ſun, or by the fire, with other ingredients ſometimes added to them to make them keep; imported chiefly from beyond ſea, and ſold by the grocers. Such are raiſins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other ſpices; which ſee under their reſpective articles.

Under the denomination of *dry fruits* are alſo frequently included apples, pears, almonds, filberds, &c.

FRUIT-Flies, a name given by gardeners and others to a ſort of ſmall black flies found in vaſt numbers among fruit trees, in the ſpring ſeaſon, and ſuppoſed to do great injury to them. Mr Leeuwenhoeck preſerved ſome of theſe flies for his microſcopical obſervations. He found that they did not live longer than a day or two, but that the females during this time laid a great number of longiſh eggs. The gardeners who ſuppoſe that theſe flies wound the leaves of the trees, are miſtaken: it is true that they feed on their juices; but they have no inſtruments wherewith they can extract theſe for themſelves: they feed on ſuch as are naturally extravaſated; and when there is not a ſufficient quantity of theſe for their purpoſe, they haunt the places to which the pucerous reſort, and feed on the juices which theſe little creatures extravaſate by means of the holes they bore in the leaves with their trunks. Fruit.

FRUIT Stones. The miſchiefs ariſing from the cuſtom which many people have of ſwallowing the ſtones of plums and other fruit are very great. The Philoſophical Tranſactions give an account of a woman who ſuffered violent pains in her bowels for 30 years, returning once in a month or leſs. At length, a ſtrong purge being given her, the occaſion of all theſe complaints was driven down from the bowels to the anus; where it gave a ſenſation of diſtenſion and ſtoppage, producing a continual deſire of going to ſtool, but without voiding any thing. On the aſſiſtance of a careful hand in this caſe, there was taken out with a forceps a ball of an oval figure, of about ten drachms in weight, and meaſuring five inches in circumference. This had cauſed all the violent fits of pain which ſhe had ſuffered for ſo many years; and, after voiding it, ſhe became perfectly well. The ball extracted looked like a ſtone, and felt very hard, but it ſwam in water. On cutting it through with a knife, there was found in the centre of it a plum ſtone; round which ſeveral coats of this hard and tough matter had gathered. Another inſtance given in the ſame papers is of a man, who, dying of an incurable colic which had tormented him many years, and baffled the effects of medicines, was opened after death; and in his bowels was found a ball ſimilar to that above mentioned; but ſomewhat larger, being ſix inches in circumference, and weighing an ounce and a half. In the centre of this, as of the other, there was found the ſtone of a common plum, and the coats were of the ſame nature with thoſe of the former.

Theſe and ſeveral other inſtances mentioned in the ſame place, ſufficiently ſhow the folly of that common opinion that the ſtones of fruits are wholeſome. For though by nature the guts are ſo defended by their proper mucus, that people very ſeldom ſuffer by things of this kind; yet if we conſider the various circumvolutions of the guts, their valves and cells, and at the ſame time conſider the hair of the ſkins of animals we feed on, the wool or down on herbs and fruit, and the fibres, veſſels, and nerves of plants, which are not altered by the ſtomach; it will appear a wonder that inſtances of this ſort of miſchief are not much more common. Cherry ſtones, ſwallowed in great quantities, have occaſioned the death of many people; and there have been inſtances even of the ſeeds of ſtrawberries collecting into a lump in the guts, and cauſing violent diſorders, which could not be cured without great difficulty.

FRUIT Trees. With regard to theſe it may be obſerved, 1. That the cutting and pruning them when young hurt their bearing, though it contributes to the

Fruitery ‖ Fruſtum.

the richneſs and flavour of the fruit, as well as to the beauty of the tree. 2. That kernel fruit trees come later to bear than ſtone fruit trees: the time required by the firſt, before they come to any fit age for bearing, being one with another five years; but when they do begin, they bear in greater plenty than ſtone fruit. 3. That ſtone fruit, figs, and grapes, commonly bear conſiderably in three or four years, and bear full crops the fifth and ſixth year; and hold it for many years, if well ordered. 4. That fruit trees in the ſame neighbourhood will ripen a fortnight ſooner in ſome grounds than in others of a different temperature. 5. That in the ſame country, hot or cold ſummers ſet conſiderably forwards, or put backwards, the ſame fruit. 6. That the fruit on wall trees generally ripen before thoſe on ſtandards, and thoſe on ſtandards before thoſe on dwarfs. 7. That the fruit of all wall trees planted in the ſouth and caſt quarters commonly ripen about the ſame time, only thoſe in the ſouth rather earlier than thoſe in the eaſt; thoſe in the weſt are later by eight or ten days; and thoſe in the north by 15 or 20. For the planting, pruning, grafting, &c. of fruit trees, ſee GARDENING.

FRUITERY, a place for the keeping of fruit, a fruit houſe, or fruit loft.

A fruitery ſhould be inacceſſible to any thing of moiſture; and ſhould be as much as poſſible ſo, even to froſt.

FRUMENTACEOUS, a term applied by botaniſts to all ſuch plants as have a conformity with wheat, in reſpect of their fruits, leaves, ears, or the like.

FRUMENTARII, a kind of ſoldiers or archers under the weſtern empire.

The firſt time we read of theſe officers is in the reign of the emperor Adrian, who made uſe of them to inform himſelf of whatever paſſed. They did not make any particular corps diſtinct from the reſt of the forces, but there was a certain number of them in each legion. It is ſuppoſed, that they were at firſt a number of young perſons, diſpoſed by Auguſtus throughout the provinces, particularly on all the great roads, to acquaint the emperor, with all expedition, of every thing that happened.

Afterwards they were incorporated into the troops themſelves, where they ſtill retained their ancient name. As their principal office was the giving intelligence, they were often joined with the curioſi, with whom they agreed in that part of their office.

Their name of *frumentarii* is derived from their being alſo a ſort of purveyors to the armies, cities, &c. collecting all the corn from the ſeveral provinces to furniſh the commonwealth.

FRUMENTATION, in Roman antiquity, a largeſs of corn beſtowed on the people. This practice of giving corn to the people was very ancient among the Romans, and frequently uſed to ſoothe the turbulent humour of the populace. At firſt the number of thoſe to whom this largeſs was given was indeterminate, till Auguſtus fixed it at 200,000.

FRUSH, or RUNNING THRUSH. See FARRIERY *Index*.

FRUSTUM, in *Mathematics*, a part of ſome ſolid body ſeparated from the reſt.

The fruſtum of a cone is the part that remains, when the top is cut off by a plane parallel to the baſe; and is otherwiſe called a *truncated cone*. See *CONIC Sections*.

Fruſtum ‖ Fucinus.

The fruſtum of a pyramid is alſo what remains after the top is cut off by a plane, parallel to its baſe.

The fruſtum of a globe or ſphere is any part thereof cut off by a plane, the ſolid contents of which may be found by this rule: To three times the ſquare of the ſemidiameter of the baſe add the ſquare of its height; then multiply that ſum by the height, and this product multiplied by .5236 gives the ſolidity of the fruſtum.

FRUTEX, a SHRUB. Shrubs, according to Linnæus, make a branch of the ſeventh family in the vegetable kingdom; and are diſtinguiſhed from trees, in that they come up without buds. But this diſtinction is not univerſal, though it be generally juſt with regard to thoſe of Europe. Nature hath made no abſolute diſtinction between trees and ſhrubs. *Frutex*, in its general acceptation, is a plant whoſe trunk is perennial, gemmiparous, woody, dividing and ſubdividing into a great number of branches. In ſhort, it is the epitome of a tree, exemplified in the roſe buſh.

FRY, in *Zoology*, ſignifies the ſpawn, or rather young, of fiſh.

FRYING-PAN, a dangerous ſhoal, which has received this appellation from its figure. It is ſituated at the entrance of Cape Fear river, in North Carolina, the ſouthern part of which is in long. 75° W. and 33° 22′ N. Lat. 24 miles ſouth-eaſt by ſouth of the light-houſe on Bald Head.

FRYTH, JOHN, a martyr to the Proteſtant religion in the reign of Henry VIII. He was the ſon of an innkeeper at Seven Oaks in Kent; and educated in King's college, Cambridge, where he took the degree of bachelor of arts. Thence he removed to Oxford, and was made a junior canon of Wolſey's college. He had not been long in this univerſity before he became acquainted with William Tyndale, a zealous Lutheran, with whom he converſed frequently on the abuſes in religion. Fryth became a convert to Lutheraniſm, and publicly avowed his opinions. He was apprehended, examined by the commiſſary, and confined to his college. At length having obtained his liberty, in 1528 he went over to Germany, where he continued about two years; and then returned to England, more than ever determined in his religious ſentiments. Finding at that time but few aſſociates, he wandered about from place to place, till at laſt he was taken up at Reading as a vagrant, and ſet in the ſtocks, where he remained till he was near expiring for want of ſuſtenance. He was at length relieved by the humanity of Leonard Cox, a ſchoolmaſter; who finding him a man of letters, procured his enlargement, and adminiſtered to his neceſſities. Fryth now ſet out for London, where, with more zeal than prudence, he began to make proſelytes; but was ſoon apprehended by order of the chancellor Sir Thomas More, and ſent priſoner to the Tower. Refuſing to recant his opinions, he was condemned to the flames, and accordingly burnt in Smithfield, on the 4th of July 1533. He left ſeveral works behind him, which were printed in folio in 1573.

FUAGE, in old Engliſh writers, a tax of 12d. for every fire, levied in the time of Edward III.

FUCINUS LACUS, in *Ancient Geography*, a lake of

Fucinus. Italy in the country of the Marſi. Now *Lago di Celano*, from a cognominal citadel, lying on the ſouth of the Abruzzo Ultra, in the kingdom of Naples, near the Apennines. This lake was under the protection of a god of the ſame denomination, whoſe temple ſtood on its banks. According to the teſtimony of ancient authors, it was ſubject to extraordinary riſings and decreaſings. The actual circumference is 47 miles: the breadth in the wideſt part is 10, in the narroweſt 4; its depth 12 feet upon an average. But all theſe have varied prodigiouſly. Two miles up the plain, behind Avezzano, the fragments of boats, ſhells, and other marks of its ancient extent, have been eaſually diſcovered: and, on the contrary, there are people who remember when it did not flow nearer than within two miles of Avezzano. An immenſe tract of excellent lands is loſt at every increaſe of its level. All round this noble piece of water riſes a circle of grand mountains, ſome of them the higheſt in Italy, if we except the Alps, and many of them covered with ſnow; and at the foot of them are numerous villages, with rich and well cultivated farms. The environs of the lake, Mr Swinburne deſcribes as all well encloſed, and the ſides of the hills as covered with fine woods; its waters abound with fiſh of various kinds, and thither repair at ſtated ſeaſons innumerable flights of wild fowl. As the ſwelling of the lake was attended with incredible damage, the Marſi had often petitioned the ſenate to drain it: Julius Cæſar would have attempted it, had he lived longer. His ſucceſſors were averſe to the project; till Claudius, who delighted in expenſive difficult enterpriſes, undertook it. During the ſpace of 11 years he employed 30,000 men in digging a paſſage through the mountain; and when every thing was ready for letting off the water, exhibited a ſuperb naval ſpectacle on the lake. A great number of condemned criminals were obliged to act the parts of Rhodians and Sicilians in ſeparate fleets, to engage in earneſt, and to deſtroy one another for the entertainment of the court and the multitude of ſpectators that covered the hills: A line of well armed veſſels and rafts loaded with ſoldiers ſurrounded the ſcene of action, in order to prevent any of the wretches from eſcaping; but it was with great difficulty and many threats that they could be brought to an engagement. When this ſavage diverſion was ended, the operations for opening the paſſage commenced, and the emperor was very near being ſwept away and drowned by the ſudden ruſhing of the waters towards it. However, either through the ignorance or negligence of the engineers, the work did not anſwer as was expected, and Claudius did not live long enough to have the faults amended: Nero abandoned the ſcheme through envy. Hadrian is ſaid to have let off the waters of the Fucinus; but none now eſcape except through hidden channels formed by nature, which are probably ſubject to be obſtructed, and thus occaſion a ſuperabundance of water in the lake, till ſome unknown cauſe removes the obſtructions and again gives free paſſage.

Sir William Hamilton, who viſited the Fucinus in 1785, ſays, "it is the moſt beautiful lake he ever ſaw, and would be complete if the neighbouring mountains were better wooded." It furniſhes abundance of fiſh, though not of the beſt quality. There are a few large trout, but moſtly tench, barbel and dace. In the ſhallow water on the borders of the lake, he ſaw thouſands of water ſnakes purſuing and preying upon a little kind of fiſh like our thornbacks, but much better armed; though their defenſive weapons ſeemed to avail them but little againſt ſuch ravenous foes. The opening made by Claudius he deſcribes as ſtill entire, though, in many parts filled with earth and rubbiſh. He went into it with torches as far as he could. It is a covered underground canal three miles long, and part of it cut through a hard rock; and other parts ſupported by maſon work, with wells to give light. Hadrian is ſaid to have let off the waters of the lake: and our author is of opinion, that if the canal were cleared and repaired it would ſtill anſwer that purpoſe, and thereby reſtore a great deal of rich land fit for cultivation. Fucus, Fuego.

FUCUS, a name given by the ancients to certain dyes and paints. By this name they called a purple ſea plant uſed by them to dye woollen and linen things of that colour. The dye was very beautiful, but not laſting; for it ſoon began to change, and in time went wholly off. This is the account Theophraſtus gives of it.

The women of thoſe times alſo uſed ſomething called *fucus*, to ſtain their cheeks red; and many have ſuppoſed, from the ſame word expreſſing both, that the ſame ſubſtance was uſed on both occaſions. But this, on a ſtrict inquiry, proves not to be the caſe. The Greeks called every thing *fucus* that would ſtain or paint the fleſh. But this peculiar ſubſtance uſed by the women to paint their cheeks was diſtinguiſhed from the others by the name of *rizion* among the more correct writers, and was indeed a root brought from Syria into Greece. The Latins, in imitation of the Greek name, called this root *radicula*; and Pliny very erroneouſly confounds the plant with the *radix lunaria*, or *ſtruthion* of the Greeks.

The word *fucus* was in thoſe times become ſuch an univerſal name for paint, that the Greeks and Romans had a *fucus metallicus*, which was the ceruſe uſed for painting the neck and arms white: after which they uſed the *purpuriſſum*, or red fucus of the *rizium*, to give the colour to the cheeks. In after-times they alſo uſe a peculiar *fucus* or paint for the purpoſe, prepared of the *creta argentaria*, or ſilver-chalk, and ſome of the rich purple dyes that were in uſe at that time: and this ſeems to have been very little different from our roſe-pink; a colour commonly ſold at the colour-ſhops, and uſed on like occaſions.

Fucus, in the Linnæan ſyſtem of botany, is a genus of the order of algæ, belonging to the cryptogamia claſs of plants.

FUEGO, or Fogo, one of the Cape de Verd iſlands, in the Atlantic ocean. It is much higher than any of the reſt; and ſeems at ſea to be one ſingle mountain, though on the ſides there are deep valleys. There is a volcano at the top which burns continually, and may be ſeen a great way off at ſea. It vomits a great deal of fire and ſmoke, and throws out huge pieces of rock to a vaſt height; and ſometimes torrents of melted matter run down the ſides. The Portugueſe, who firſt inhabited it, brought negro ſlaves with them, and a ſtock of cows, horſes, and hogs; but the chief inhabitants now are blacks, of the Romiſh religion. W. Long. 24. 20. Lat. 15. 0.

FUEL,

Fuel || Fugue.

FUEL, whatever is proper to burn or make a fire; as wood, turf, peat, bituminous earths, coal, &c.

FUEN-HOA, a city of China, in the province of Petcheli, celebrated for its extent and the number of its inhabitants, as well as for the beauty of its ſtreets and triumphal arches. It is ſituated near the great wall, amidſt mountains; and has under its juriſdiction, beſides two cities of the ſecond, and eight of the third claſs, a great number of fortreſſes, which bar the entrance of China againſt the Tartars.

FUGALIA, in Roman antiquity, a feaſt ſuppoſed by ſome to be the ſame with the *refugium*, held on the 24th of February, in memory of the expulſion of the kings and the aboliſhing of monarchical government. Others again diſtinguiſh the fugalia from the regifuge. And others think, that the fugalia was the ſame with the *poplifugia*, or the feaſt of Fugia, the goddeſs of joy, occaſioned by the rout of an enemy, which was the reaſon the people abandoned themſelves to riot and debauchery.

FUGITIVE, a perſon obliged to fly his country or remove from a place where he had ſome abode or eſtabliſhment, on account of his crimes, debts, or other occaſions.

FUGITIVE Pieces, among the learned, denote thoſe little compoſitions which are printed on looſe ſheets or half ſheets; thus called, becauſe eaſily loſt and ſoon forgotten.

FUGUE, in *Muſic*, (from the Latin *fuga*, "a chaſe"), a piece of muſic ſometimes longer and ſometimes ſhorter, in which, agreeable to the rules of harmony and modulation, the compoſer treats a ſubject; or, in other words, what expreſſes the capital thought or ſentiment of the piece, in cauſing it to paſs ſucceſſively and alternately from one part to another.

Theſe are the principal rules of the fugue; of which ſome are peculiar to itſelf, and others common to it with what the French call *imitation*.

1. The ſubject proceeds from the tonic to the dominant, or from the dominant to the tonic, in riſing or deſcending.

2. Every fugue finds its reſponſe in the part immediately following that which commenced.

3. That reſponſe ought to reſume the ſubject in the interval of a fourth or fifth above or below the key, and to purſue it as exactly as the laws of harmony will admit; proceeding from the dominant to the tonic when the ſubject is introduced from the tonic to the dominant, and moving in a contrary direction when the ſubject is introduced from the dominant to the tonic. One part may likewiſe reſume the ſame ſubject in the octave or uniſon of the preceding; but in that caſe, it is a repetition rather than a real reſponſe.

4. As the octave is divided into two unequal parts, of which the one contains four gradations deſcending from the tonic to the dominant, and the other only three in continuing the aſcent from the dominant to the tonic; this renders it neceſſary to have ſome regard to this change in the expreſſion of the ſubject, and to make ſome alterations in the reſponſe, that we may not quit the cords that are eſſential to the mode. It is a different caſe when the compoſer intends to alter the modulation; for there the exactneſs of the reſponſe itſelf, when taken in a different tone, produces the alteration proper for this change.

5. It is neceſſary that the fugue ſhould be planned in ſuch a manner, that the reſponſe may commence before the cloſe of the firſt air, ſo that both the one and the other may be in part heard at the ſame time: that, by this anticipation, the ſubject may be as it were connected with itſelf, and that the art of the compoſer may diſcover itſelf in this concourſe. It is abſolute mockery, inſtead of a fugue, to impoſe upon the hearers the ſame air, merely tranſpoſed from one key to another, without any other reſtraint than an accompaniment afterwards formed at pleaſure. This deſerves at beſt no better name than what the French call *imitation*. See IMITATION. Fugue.

Beſides theſe rules, which are fundamental, there are others which, though preſcribed by taſte alone, are not leſs eſſential. Fugues, in general, render muſic more noiſy than agreeable; it is for this reaſon that they are more agreeable in the chorus than anywhere elſe. Now, as their chief merit conſiſts in fixing the ear on the principal air or ſubject, which for this reaſon is made to paſs inceſſantly from part to part, and from mode to mode, the compoſer ought to exert his care in preſerving that air always diſtinct; or to prevent it from being abſorbed in, or confounded with, the other parts. To produce this effect, there are two different ways; one in the movement, which muſt be inceſſantly contracted with itſelf; ſo that, if the procedure of the fugue be accelerated, the other parts move gravely and with protracted notes; or, on the contrary, if the motion of the fugue be ſlow and ſolemn, the accompaniments muſt have more and quicker buſineſs. The other method is to extend the harmony, by removing the parts at a greater diſtance one from the other; leſt the others, too nearly approximated to that which contains the ſubject, ſhould be confounded with it, and prevent it from being diſtinguiſhed with ſufficient clearneſs; ſo that what would be an imperfection anywhere elſe, becomes here a beauty.

The unity of melody ſhould be preſerved: this is the great and general rule, which muſt frequently be practiſed by different means. The cords muſt be choſen, and the intervals, ſo that one particular ſound may produce the chief effect; this can only reſult from the unity of the melody. It will ſometimes be neceſſary to employ voices and inſtruments of different kinds, that the parts which ought to prevail may be moſt eaſily diſtinguiſhed; this again ſhows the neceſſity of preſerving the unity of the melody. Another object of attention, no leſs neceſſary, is, in the different connections of modulation which are introduced by the procedure and progreſs of the fugues, to cauſe all theſe modulations to correſpond at the ſame time in all the parts, to connect the whole in its progreſs by an exact conformity of modes: leſt, if one part be in one mode, and another in another, the general harmony ſhould be in none at all, and for that reaſon ſhould no longer be able to produce ſimple effects upon the ear, nor ſimple ideas in the mind; which is another reaſon for preſerving unity of melody. In a word, in every fugue the confuſion of melodies and modulations is at once what a compoſer has moſt to fear, and will find the greateſt difficulty in avoiding; and as this kind of muſic never produces a pleaſure above mediocrity, one may ſay that a fine fugue is, though the maſterpiece of an excellent harmoniſt, ungrateful to his toil.

There

Fugue ‖ Fuller.

There are ſtill ſeveral other kinds of fugues; ſuch as the perpetual fugue*, the double fugue, the inverted fugue.

* See *Canon.*

The inverted fugue is a manner of compoſition, in which the flying part proceeds in a contrary direction to the other fugue, which had been formerly fixed in the ſame piece of muſic. Thus, when the firſt fugitive part is heard in aſcending from the tonic to the dominant, or from the dominant to the tonic, the counter fugue ought to be heard in deſcending from the dominant to the tonic, or from the tonic to the dominant, and *vice verſa*. Its other rules are exactly like thoſe of the common fugue.

FULCRUM, in *Mechanics*, the prop or ſupport by which a lever is ſuſtained.

FULDA, a conſiderable town of Germany, in the circle of the Upper Rhine, and in the Buchow, with a celebrated abbey; whoſe abbot is primate of the abbeys of the empire, perpetual chancellor of the emperor, and ſovereign of a ſmall territory lying between Heſſe, Franconia, and Thuringia. It is ſeated on the river Fulda, 55 miles ſouth of Caſſel, and 58 north-eaſt of Francfort. E. Long. 9. 33. N. Lat. 50. 32.

FULGORA, a genus of inſects belonging to the order of hemiptera. See ENTOMOLOGY *Index*.

FULHAM, a village of Middleſex, four miles from London. The Danes in 869 wintered at this place till they retired to the continent. It was in the Conqueror's time held of the king by the canons of St Paul's; and there is an ancient houſe here, which is moated about, and belongs to the ſee of London, whoſe biſhop has a palace here, and the demeſne has belonged to that dioceſe from 1067. From this place to Putney there is a wooden bridge over the Thames, where not only horſes, coaches, and all carriages, but even foot paſſengers pay toll. The church here is both a rectory and a vicarage.

FULICA, the GALLINULE and COOT, a genus of birds belonging to the order of grallæ. See ORNITHOLOGY *Index*.

FULIGINOUS, whatever proceeds from a thick footy ſmoke, ſuch as lamp black.

FULIGNO, a city of Italy, in the pope's territories, 10 miles north of Spoletto.

FULIGO, in *Natural Hiſtory*, a ſpecies of pumice-ſtone. See PUMICE.

FULLER, DR THOMAS, a learned Engliſh divine, was born at Alvinckle, near Oundle, in Northamptonſhire, about the year 1608, and ſtudied at Cambridge. He was choſen miniſter of St Bennet's there; and at about 23 years of age, his merit procured him a fellowſhip in Sidney-college, and a prebend in Saliſbury cathedral. He was ſoon after preſented to the rectory of Broad Windſor in Dorſetſhire; and afterwards was made lecturer of the Savoy in London: but upon the preſſing of the covenant, he retired to Oxford; and ſoon after accompanied Sir Ralph Hopton as his chaplain in the army, which he attended in their marches from place to place. After the death of King Charles I. he obtained the living of Waltham-abbey, and was appointed lecturer of St Clement's; and ſhortly after removed to the lecture of St Bridge's, Fleet-ſtreet. Upon the reſtoration, he recovered his prebend in the cathedral of Saliſbury, was appointed chaplain extraordinary to his majeſty, and created doctor of divinity. It is ſaid, his memory was ſo tenacious and comprehenſive, that he could make uſe of a ſermon *verbatim* if he once heard it. He once undertook, in paſſing to and from Temple-bar to the Poultry, to tell at his return every ſign as it ſtood in order on both ſides of the way, repeating them either backwards or forwards; and this taſk he actually performed. He wrote, 1. A Hiſtory of the Holy War. 2. The Church-Hiſtory of Britain, in folio. 3. Andronicus, or the Unfortunate Politician, in 8vo. 4. A Piſgah-ſight of Paleſtine. 5. A Hiſtory of Engliſh Worthies; and other works. He died in Auguſt 1661; and was interred in the chancel of Cranford church, in Middleſex, whither his body was attended by at leaſt 200 of his brethren of the miniſtry. Fuller.

FULLER, a workman employed in the woollen manufactories to mill or ſcour cloths, ſerges, and other ſtuffs, in order to render them more thick, compact, and durable. See FULLING.

FULLER'S Earth, in *Natural Hiſtory*, a ſpecies of clay, of a grayiſh aſh-coloured brown, in all degrees from very pale to almoſt black, and it has generally ſomething of a greeniſh caſt. It is very hard and firm, of a compact texture, of a tough and ſomewhat duſty ſurface that adheres ſlightly to the tongue. It is very ſoft to the touch, not ſtaining the hands, nor breaking eaſily between the fingers. It has a little harſhneſs between the teeth, and melts freely in the mouth. Thrown into water, it makes no ebullition or hiſſing; but ſwells gradually in bulk, and falls into a fine ſoft powder. It makes no efferveſcence with aquafortis.

The greateſt quantity and the fineſt earth of this kind in the world, is dug in the pits at Wavedon, near Woburn in Bedfordſhire. The ſtrata in theſe pits lie thus: From the ſurface to the depth of ſix feet, there are ſeveral layers or beds of ſand, all reddiſh, but ſome lighter coloured than others. Under theſe there is a thin ſtratum of a ſand-ſtone, which they break through, and then there is the fuller's earth. The upper ſtratum of this is about a foot thick: the workmen call it *cledge*, and throw it aſide as uſeleſs; being commonly fouled with the ſand which originally covered it, and which inſinuates itſelf a good way into it. After this, they come to the fine fuller's earth for ſale, which lies to the depth of eight feet more. The matter of this is divided into ſeveral layers, there being commonly about a foot and a half between one horizontal fiſſure and another. Of theſe ſeveral layers, the upper half, where the earth breaks itſelf, is tinged red; which ſeems to be owing to the running of the water upon it from among the ſands above; ſome of which are probably of a ferruginous nature, or have ferruginous matter among them. This reddiſh fuller's earth the workmen call *crop*; and between the cledge and this there is a thin ſtratum of matter, of leſs than an inch, which in taſte, colour, and external appearance, reſembles the terra Japonica of the ſhops. The lower half of the ſtrata of fuller's earth they call *wall-earth*. This is untinged with the red colour of the other, and ſeems the moſt proper for fulling. Under the fuller's earth there is a ſtratum of white and coarſe ſtone about two feet thick. They ſeldom dig through this; but if they do, they find more ſtrata of ſand.

This earth is of great uſe in ſcouring cloths, ſtuffs, &c. imbibing all the greaſe and oil uſed in preparing, dreſſing,

Fuller ‖ Fulling.

dreſſing, &c. of the wool; for which reaſon it is made a contraband commodity, and is not to be exported under the penalty of 1s. for every pound weight. See FULLING.

FULLER'S Weed, or *Teazle*. See DIPSACUS, BOTANY *Index*.

FULLERY, a place where cloths, &c. are fulled. See the next article.

FULLING, the art or act of cleanſing, ſcouring, and preſſing cloths, ſtuffs, and ſtockings, to render them ſtronger, cloſer, and firmer: called alſo *milling*. Pliny (lib. vii. cap. 56.) aſſures, that one Nicias, the ſon of Hermias, was the firſt inventor of the art of fulling: and it appears by an inſcription, quoted by Sir G. Wheeler, in his Travels through Greece, that this ſame Nicias was a governor in Greece in the time of the Romans.

Fulling of woollen cloths, depends, like felting, ſo entirely upon the ſtructure of wool and hair, that thoſe who have read our account of that proceſs, will not find it difficult to comprehend the following obſervations.

The aſperities with which the ſurface of wool is everywhere ſurrounded, and the diſpoſition which it has to aſſume a progreſſive motion towards the root, render the ſpinning of wool, and making it into cloth, difficult operations. In order to ſpin wool, and afterwards convert it into cloth, its fibres muſt be covered with a coating of oil, which, filling the cavities, renders the aſperities leſs ſenſible; in the ſame way as oil renders the ſurface of a very fine file leſs rough, when rubbed over it. When the piece of cloth is finiſhed, it muſt be cleanſed from this oil; which would cauſe it to ſoil whatever it came in contact with, beſides giving it a diſagreeable ſmell, and prevent its taking the colour which is intended to be given to it by the dyer. To deprive it of the oil, it is carried to the fulling-mill, where it is beat with hammers in a trough full of water, in which ſome clay has been mixed; the clay combines with the oil, which it ſeparates from the cloth, and both together are waſhed away by the freſh water which is brought to it by the machine; thus, after a certain time, the oil is entirely waſhed out of the cloth.

But the ſcouring of the cloth is not the only object in fulling it; the alternate preſſure given by the mallets to the piece of cloth, occaſions, eſpecially when the ſcouring is pretty far advanced, an effect analogous to that which is produced upon hats by the hands of the hatter; the fibres of wool which compoſe one of the threads, whether of the warp or the woof, aſſume a progreſſive movement, introduce themſelves among thoſe of the threads neareſt to them, then into thoſe which follow; and thus, by degrees, all the threads, both of the warp and the woof, become felted together. The cloth, after having, by the above means, become ſhortened in all its dimenſions, partakes both of the nature of cloth and of that of felt; it may be cut without being ſubject to ravel, and, on that account, we are not obliged to hem the edges of the pieces of which clothes are made. Laſtly, as the threads of the warp and thoſe of the woof are no longer ſo diſtinct and ſeparated from each other, the cloth, which has acquired a greater degree of thickneſs, forms a warmer clothing. Knit worſted alſo is, by fulling, rendered leſs apt to run, in caſe a ſtitch ſhould happen to drop in it.

Fulling.

The fulling of cloths and other ſtuffs is performed by a kind of water-mill, thence called a *fulling* or *ſcouring mill*.

Theſe mills, excepting in what relates to the mill-ſtones and hopper, are much the ſame with corn-mills: and there are even ſome which ſerve indifferently for either uſe: corn being ground, and cloths fulled, by the motion of the ſame wheel. Whence, in ſome places, particularly in France, the fullers are called *millers*; as grinding corn and milling ſtuffs at the ſame time.

The principal parts of the fulling-mill are, The wheel, with its trundle; which gives motion to the tree or ſpindle, whoſe teeth communicate it to the peſtles or ſtampers, which are hereby raiſed and made to fall alternately according as its teeth catch on or quit a kind of latch in the middle of each peſtle. The peſtles and troughs are of wood; each trough having at leaſt two, ſometimes three peſtles, at the diſcretion of the maſter, or according to the force of the ſtream of water. In thoſe troughs are laid the cloths, ſtuffs, &c. intended to be fulled: then, letting the current of water fall on the wheel, the peſtles are ſucceſſively let fall thereon, and by their weight and velocity ſtamp and preſs the ſtuffs very ſtrongly, which by this means become thickened and condenſed. In the courſe of the operation, they ſometimes make uſe of urine, ſometimes of fuller's earth, and ſometimes of ſoap. To prepare the ſtuffs to receive the firſt impreſſions of the peſtle, they are uſually laid in urine; then in fuller's earth and water; and, laſtly, in ſoap diſſolved in hot water. Soap alone would do very well; but this is expenſive: though fuller's earth, in the way of our dreſſing, is ſcarce inferior thereto, but then it muſt be well cleared of all ſtones and grittineſſes, which are apt to make holes in the ſtuff. As to urine, it is certainly prejudicial, and ought to be entirely diſcarded; not ſo much on account of its ill ſmell, as of its ſharpneſs and ſaltneſs, which qualities are apt to render the ſtuffs dry and harſh.

The true method of fulling with ſoap is delivered by Monſ. Colinet, in an authentic memoir on that ſubject, ſupported by experiments made by order of the marquis de Louvois, then ſuperintendant of the arts and manufactories of France; the ſubſtance of which we ſhall here ſubjoin.

Method of FULLING *Cloths and Woollen Stuffs with Soap.*—A coloured cloth, of about 45 ells, is to be laid in the uſual manner in the trough of a fulling-mill; without firſt ſoaking it in water, as is commonly practiſed in many places. To full this trough of cloth, 15 pounds of ſoap are required; one-half of which is to be melted in two pails of river or ſpring water, made as hot as the hand can well bear it. This ſolution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough: and thus it is to be fulled for at leaſt two hours; after which it is to be taken out and ſtretched. This done, the cloth is immediately returned into the ſame trough, without any new ſoap, and there fulled two hours more. Then taking it out, they wring it well, to expreſs all the greaſe and filth. After the ſecond fulling, the remainder of the ſoap is diſſolved as in the former, and caſt four different times on the cloth; remembering to take out the cloth every two hours, to ſtretch it, and undo the plaits and wrinkles it has acquired in the trough.

When

Fulling || Funambulus.

When they perceive it ſufficiently fulled, and brought to the quality and thickneſs required, they ſcour it for good in hot water, keeping it in the trough till it be quite clean. As to white cloths; in regard theſe full more eaſy and in leſs time than coloured ones, a third part of the ſoap may be ſpared.

FULLING of Stockings, Caps, &c. ſhould be performed ſomewhat differently; viz. either with the feet or the hands; or a kind of rack, or wooden machine, either armed with teeth of the ſame matter, or elſe horſes or bullocks teeth. The ingredients made uſe of herein are, urine, green ſoap, white ſoap, and fuller's earth. But the urine alſo is reckoned prejudicial here. Woven ſtockings, &c. ſhould be fulled with ſoap alone: for thoſe that are knit, earth may be uſed with the ſoap. Indeed it is frequent to full theſe kinds of works with the mill, after the uſual manner of cloth, &c. But that is too coarſe and violent a manner, and apt to damage the work unleſs it be very ſtrong.

FULMAR, in *Ornithology*. See PROCELLARIA, ORNITHOLOGY *Index*.

FULMAR, or *Foumart*. See MUSTELA, MAMMALIA *Index*.

FULMINATING, ſomething that thunders or reſembles thunder.

FULMINATING Gold, Silver, Copper, Quickſilver, &c. See CHEMISTRY *Index*.

FULMINATION, in *Chemiſtry*, the ſame with detonation.

FULMINATION, in the Romiſh canon law, a ſentence of a biſhop, official, or other eccleſiaſtic appointed by the pope, by which it is decreed that ſome bull ſent from the pope ſhall be executed.

FUMARIA, FUMITORY, a genus of plants belonging to the diadelphia claſs, and in the natural method ranking under the 24th order, *Corydales*. See BOTANY *Index*.

FUMIGATION, in *Chemiſtry*, a kind of calcination, when metals or other hard bodies are corroded or ſoftened by receiving certain fumes for that purpoſe.

FUMIGATION, in *Medicine*, By the ſubtile fumes that are inſpired as well as inhaled into our bodies, much benefit or prejudice is produced, according to the nature of the matter, and the conſtitution into which it is received; as is evident from the palſies produced among workers in lead-mines, &c. and the benefits received in many caſes when the air is impregnated with ſalutary materials. Catarrhs and catarrhous coughs are relieved by fumes received with the breath; and, by the ſame method, expectoration is aſſiſted in humoural aſthmas; and even ulcers in the lungs are ſaid to have been healed by this method. The advantage of mercurial fumigations in the cure of venereal ulcers is known to every practitioner.

FUMITORY. See FUMARIA, BOTANY *Index*.

FUNAMBULUS, among the Romans, was what we call a *rope-dancer*, and the Greeks *ſchœnobates*. See *Rope-DANCER*.

There was a funambulus, it ſeems, who performed at the time when the Hecyra of Terence was acted; and the poet complains, that the ſpectacle prevented the people from attending to his comedy. *Ita populus ſtudio ſtupidus in* funambulo, *animum occuparat.*

At Rome, the funambuli firſt appeared under the conſulate of Sulpicius Pæticus and Licinius Stolo, who were the firſt introducers of the ſcenic repreſentations. It is added, that they were firſt exhibited in the iſland of the Tyber, and that the cenſors Meſſala and Caſſius afterwards promoted them to the theatre. Funambulus || Fund.

In the *Floralia*, or *ludi Florales*, held under Galba, there were funambulatory elephants, as we are informed by Suetonius. Nero alſo ſhowed the like, in honour of his mother Agrippina. Vopiſcus relates the ſame of the time of Carinus and Numerianus.

FUNCHAL, the capital of Madeira, ſituated round a bay, on a gentle aſcent, and containing about 15,000 inhabitants. It is watered by ſeveral ſtreams from the mountains; and is defended by a caſtle on a ſteep rock, which is ſurrounded by the ſea at high water. The houſes are built of brick or free-ſtone; but the ſtreets are narrow, dark and dirty. W. Long. 16. 49. N. Lat. 32. 38.

FUNCTION, the act of fulfilling the duties of any employment.

FUNCTION, being alſo applied to the actions of the body, is by phyſicians divided into vital, animal, and natural. The *vital* functions are thoſe neceſſary to life, and without which the individual cannot ſubſiſt; as the motion of the heart, lungs, &c. The *natural* functions are ſuch as it cannot ſubſiſt any conſiderable time without; as the digeſtion of the aliment, and its converſion into blood. Under *animal* functions are included the ſenſes of touching, taſting, &c. memory, judgment, and voluntary motion; without any or all of which an animal may live, but not very comfortably.

The animal functions perform the motion of the body by the action of the muſcles; and this action conſiſts chiefly in the ſhortening the fleſhy fibres, which is called *contraction*, the principal agents of which are the arteries and nerves diſtributed in the fleſhy fibres.

All parts of the body have their own functions, or actions, peculiar to themſelves. Life conſiſts in the *exerciſe* of theſe functions, and health in the *free and ready* exerciſe of them.

FUNCTION, a term uſed in analytics for an algebraical expreſſion any how compounded of a certain letter or quantity with other quantities or numbers; and the expreſſion is ſaid to be a function of that letter or quantity. Thus $a - 4x$, or $ax + 3x^2$, or $2x - a\sqrt{a^2 - x^2}$, or x^c, or c^x, is each of them a function of the quantity x.

FUND, in general, ſignifies any ſum of money appropriated for a particular purpoſe. Thus, that part of the national revenue which is ſet apart for the payment of the national debt, is called the *ſinking fund*. But, when we ſpeak of *the funds*, we generally mean the large ſums which have been lent to government, and conſtitute the national debt; and for which the lenders, or their aſſignees, receive intereſt from revenues allotted for that purpoſe. The term *ſtock* is uſed in the ſame ſenſe, and is alſo applied to the ſums which form the capital of the bank of England, the Eaſt India and South Sea companies; the proprietors of which are entitled to a ſhare of the profits of the reſpective companies.

The

Fund. The practice of funding was introduced by the Venetians and Genoeſe in the 16th century, and has been adopted ſince by moſt of the nations in Europe. Princes had often borrowed money, in former times, to ſupply their exigencies, and ſometimes mortgaged their territories in ſecurity: but theſe loans were generally extorted, and their payment was always precarious; for it depended on the good faith and ſucceſs of the borrower, and never became a regular burden on poſterity. The origin of funds is derived from the peculiar manners and circumſtances of modern Europe. Since the invention of gunpowder, and the progreſs of commerce, the military occupation has become a diſtinct employment in the hands of mercenaries; the apparatus of war is attended with more expence; and the deciſion of national quarrels has often been determined by command of money rather than by national bravery. Ambitious princes have therefore borrowed money, in order to carry on their projects with more vigour. Weaker ſtates have been compelled, in ſelf-defence, to apply to the ſame reſource; the wealth introduced by commerce has afforded the means; the regularity of adminiſtration, eſtabliſhed in conſequence of the progreſs of civility, has increaſed the confidence of individuals in the public ſecurity; the complicated ſyſtem of modern policy has extended the ſcenes of war, and prolonged their duration; and the colonies eſtabliſhed by mercantile nations have rendered them vulnerable in more points, and increaſed the expence of defending them.

When a greater ſum has been required for the annual expence than could eaſily be ſupplied by annual taxes, the government have propoſed terms to their own ſubjects, or foreigners, for obtaining an advance of money by mortgaging the revenue of future years for their indemnification. This mortgage may either be for a limited period, or perpetual. If the ſum allotted annually for the benefit of thoſe who advance the money, be conſiderably greater than the intereſts of the ſums advanced, they may agree to accept of ſuch allowance, for a limited time, as a full equivalent. Thus, they may either agree for the caſual produce of the revenue aſſigned; or a fixed annuity for a greater or leſs number of years; or a life annuity to themſelves or nominees; or an annuity for two or more lives; or an annuity, with the benefit of ſurvivorſhip, called a *tontine*, in which ſcheme, the whole ſum to which the original annuitants were entitled continues to be diſtributed among the ſurvivors.

The eſtabliſhment of the funds was introduced in Britain at the Revolution; and has ſince been gradually enlarged, and carried to an amazing extent. The various methods above mentioned have been uſed in their turns, but perpetual annuities have been granted for the greateſt part; and, even when the money was originally advanced on other conditions, the lenders have been ſometimes induced, by ſubſequent offers, to accept of perpetual annuities, inſtead of the former terms. The debt for which perpetual annuities are granted, is called the *redeemable debt*, and the other is called the *irredeemable debt*. Although the debts thus contracted by government are ſeldom paid for a long term of years; yet any creditor of the public may obtain money for what is due him when he pleaſes, by tranſferring his property in the funds to another; and regular methods are appointed for tranſacting theſe transfers in an eaſy manner. By means of this, the ſtocks become a kind of circulating capital; and have the ſame effect, in ſome reſpects, as the circulating money in the nation. When a ſtockholder transfers his ſhare, he may ſometimes be able to obtain a greater price than the original value, and at other times be obliged to accept of a leſs one. The value of the funds depends on the proportion between the intereſt they bear, and the benefit which may be obtained by applying the money to other purpoſes. It is influenced by the plenty or ſcarcity of money, and by the quantity of the public debt; and it is impaired by any event which threatens the ſafety, or weakens the credit, of the government. Fund.

The buſineſs of ſtock-jobbing is founded on the variation of the prices of ſtock. Perſons poſſeſſed of real property may buy or ſell ſtock, according to their notion that the value is likely to riſe or fall, in expectation of making profit by the difference of price. And a practice has taken place among perſons who often poſſeſs no property in the funds, to contract for the ſale of ſtock againſt a future day, at a price now agreed on. For inſtance: A agrees to ſell B 1000l. of bank ſtock, to be transferred, in 20 days, for 1200l. A has, in fact, no ſuch ſtock; but, if the price of bank ſtock, on the day appointed for the transfer, ſhould be only 118 per cent. A may purchaſe as much as will enable him to fulfil his bargain for 1180l. and thus gains 20l. by the tranſaction; on the contrary, if the price of bank ſtock be 125 per cent. he will loſe 50l. The buſineſs is generally ſettled without any actual purchaſe or transfer of ſtock, by A paying to B, or receiving from him, the difference between the current price of the ſtock on the day appointed and the price bargained for.

This practice, which is really nothing elſe than a wager concerning the price of ſtock, is contrary to law; yet it is carried on to a great extent. In the language of Exchange Alley, where matters of this kind are tranſacted, the buyer is called a *bull*, and the ſeller a *bear*. As neither party can be compelled by law to implement theſe bargains, their ſenſe of honour, and the diſgrace and loſs of future credit, which attend a breach of contract, are the principles by which the buſineſs is ſupported. When a perſon declines to pay his loſs, he is called a *lame duck*, and dare never afterwards appear in the Alley. This opprobrious appellation, however, is not beſtowed on thoſe whoſe failure is owing to want of ability, providing they make the ſame ſurrender of their property voluntarily, which the law would have exacted if the debt had been entitled to its ſanction.

The intereſt or dividend on the ſtock is paid half-yearly; and the purchaſer has the benefit of the intereſt due on the ſtock he buys, from the laſt term to the time of purchaſe. Therefore the prices of the ſtocks riſe gradually, *cæteris paribus*, from term to term, and fall at the term when the intereſt is paid. In comparing the prices of the different ſtocks, it is neceſſary to advert to the term when the laſt intereſt was paid: and, allowance being made for this circumſtance, the prices of all the government ſtocks, which bear intereſt at the ſame rate, muſt be nearly the ſame, as they all depend on the ſame ſecurity.

Fund. When a loan is propoſed, ſuch terms muſt be offered to the lenders, as may render the tranſaction beneficial: and this is now regulated by the prices of the old ſtocks. If the ſtocks, which bear intereſt at 4 per cent. ſell at par, or rather above, the government may expect to borrow money at that rate; but, if theſe ſtocks are under par, the government muſt either grant a higher intereſt, or ſome other advantage to the lenders, in compenſation for the difference. For this purpoſe, beſides the perpetual annuity, another annuity has ſometimes been granted for life, or for a term of years. Lotteries have frequently been employed to facilitate the loan, by entitling the ſubſcribers to a certain number of tickets, for which no higher price is charged than the exact value diſtributed in prizes, though their market price is generally 2l. or 3l. higher. Sometimes an abatement of a certain proportion of the capital has been granted, and a lender entitled to hold 100l. ſtock, though in reality he advanced no more perhaps than 95l.

It belongs to the chancellor of the exchequer to propoſe the terms of the loan in parliament: and he generally makes a previous agreement with ſome wealthy merchants, who are willing to advance the money on the terms propoſed. The ſubſcribers to the loan depoſit a certain part of the ſum ſubſcribed; and are bound to pay the reſt by inſtalments, or ſtated proportions, on appointed days, under pain of forfeiting what they have depoſited. For this they are entitled, perhaps, not only to hold their ſhare in the capital, but to an annuity for 10 years, and to the right of receiving a certain number of lottery tickets on advantageous terms. They may ſell their capital to one perſon, their annuity to a ſecond, and their right to the tickets to a third. The value of all theſe intereſts together is called *omnium*; and, in order to obtain a ready ſubſcription, it ought to amount to 102l. or upwards, on 100l. of capital. This difference is called the bonus to the ſubſcribers.

The capital advanced to the public, in the form of transferable ſtocks, and bearing intereſt from taxes appropriated for that purpoſe, is called the *funded debt*. Beſides, there is generally a conſiderable ſum due by government, which is not diſpoſed of in that manner, and therefore is diſtinguiſhed by the appellation of the *unfunded debt*. This may riſe from any ſort of national expence, for which no proviſion has been made, or for which proviſion has proved inſufficient. The chief branches are,

1ſt, *Exchequer Bills*. Theſe are iſſued from the exchequer, generally by appointment of parliament, and ſometimes without ſuch appointment, when exigencies require. They bear intereſt from the time when iſſued, and are taken in by the Bank of England, which promotes their circulation.

2d, *Navy Bills* The ſums annually granted for the navy have always fallen ſhort of what that ſervice required. To ſupply that deficiency, the admiralty iſſues bills in payment of victuals, ſtores, and the like, which bear intereſt ſix months after the time iſſued. The debt of the navy thus contracted is diſcharged, from time to time by parliament.

In time of war, the public expences, ſince the Revolution, have always been much greater than the annual revenue; and large ſums have conſequently been borrowed. In time of peace, the revenue exceeds the expence, and part of the public debt has frequently been paid off. But, though there have been more years of peace than of war ſince the funds were eſtabliſhed, the debts contracted during each war have much exceeded the payments during the ſubſequent peace. This will appear by the following abſtract of the progreſs of the national debt. Fund.

Debt at peace of Ryſwick, 1697	L. 21,515,472
Debt at the beginning of war 1701	16,394,701
Diſcharged during peace 1697 to 1701	5,121,071
Debt at peace of Utrecht 1714, including value of annuities afterwards ſubſcribed to South Sea ſtock -	55,282,978
Contracted in war 1701 to 1714	38,888,277
Debt at beginning of war 1740, including 1,000,000l. charged on civil liſt	47,954,623
Diſcharged during peace 1714 to 1739	7,328,355
Debt at peace of Aix-la-Chapelle, 1748	79,193,313
Contracted during war 1740 to 1748	31,238,690
Debt at beginning of war 1756	73,289,673
Paid off during peace 1748 to 1756	5,903,640
Debt funded at the peace 1763, including 9,839,597l. then owing, which was funded in the ſubſequent years	133,957,270
Beſides this, there was about 6,000,000l. of debt paid off, without ever being funded.	
Funded debt, 1775 - - -	125,000,000
Paid off during peace 1763 to 1775, beſides unfunded debt above mentioned - - - -	8,959,270
Funded at the peace 1783 -	211,363,254

The following is a ſtate of the national debt at a later period.

Amount of funded debt on 5th January 1805 - - -	L. 603,925,792
Stock created by loan of 1805 -	38,700,000
	L. 642,625,792
Transferred for the redemption of the land tax - - -	22,000,000
	L. 620,625,792
Redeemed by the commiſſioners for managing the ſinking fund -	113,500,000
Leaving as the amount of the national debt on the 31ſt January 1806	L. 507,125,792

It is to be obſerved that nearly 100 millions of the above amount of 507 millions, conſiſt of 4 and 5 per cent. ſtock; and if this be converted into 3 per cent. ſtock, it will make the total amount 557 millions; and taking the 3 per cent. ſtock at 60 per cent. the preſent average price, the total capital of the debt in money is 334 millions of pounds ſterling.

The original proviſion of the ſinking fund, of a million per annum, with the additions that have ſince been made to it; and the dividends on ſtock, bought up by the commiſſioners for managing that fund, amount at this time (1806) to about eight millions per annum. It has been calculated that the future rate of accumulation of the ſinking fund, continuing the ſame as hitherto, namely,

Fund || ndamen- tal.

namely, at 5 per cent. the whole amount of the national debt will be extinguiſhed in 24 years; for the annual income of the commiſſioners for the management of the ſinking fund being eight millions, this will produce by the year

1810 the ſum of	L.	34,480,000
1820		156,700,000
1830		356,000,000

which laſt ſum exceeds the preſent national debt.

FUNDAMENT, in *Anatomy*, the loweſt part of the inteſtinum rectum, called by anatomiſts the *anus*. See ANATOMY.

FUNDAMENTAL, in general ſomething that ſerves as a baſe or foundation for another.

FUNDAMENTAL, in *Muſic*. A *fundamental ſound* is that which forms the loweſt note of the CHORD, and from whence are deduced the harmonical relations of the reſt; or, which ſerves for a key to the tone †. The *fundamental baſs* is that which ſerves for a foundation to the harmony. A *fundamental chord* is that whoſe baſs is fundamental, and in which the ſounds are ranged in the ſame order as when they are generated, according to the experiment ſo often repeated by M. d'Alembert, in his Preliminary Diſcourſe and Elements of Muſic ‡. But as this order removes the parts to an extreme diſtance one from the other, they muſt be approximated by combinations or inverſions; but if the baſs remains the ſame, the chord does not for this reaſon ceaſe to bear the name of *fundamental*. Such an example is this chord, *ut mi ſol*, included in the interval of a fifth: whereas, in the order of its generation, *ut ſol mi*, it includes a tenth, and even a ſeventeenth; ſince the fundamental *ut* is not the fifth of *ſol*, but the octave of that fifth.

ee *Tonic.*

e *Muſic.*

FUNDAMENTAL Baſs. This part in muſic is, according to Rouſſeau, and indeed according to all authors who have proceeded upon M. Rameau's experiment, in its primary idea, that baſs which is formed by the fundamental notes of every perfect chord that conſtitutes the harmony of the piece; ſo that under each chord it cauſes to be heard, or underſtood, the fundamental ſound of that particular chord; that is to ſay, the ſound from whence it is derived by the rules of harmony. From whence we may ſee, that the fundamental baſs can have no other contexture than that of a regular and fundamental ſucceſſion, without which the procedure of the upper parts would be illegitimate.

To underſtand this well, it is neceſſary to be known, that, according to the ſyſtem of Rameau, which Rouſſeau has followed in his Dictionary, every chord, though compoſed of ſeveral ſounds, can only have one which is its fundamental, viz. that which produces this chord, and which is its baſs according to the direct and natural order. Now, the baſs which prevails under all the other parts, does not always expreſs the fundamental ſounds of the chords; for amongſt all the ſounds which form a chord, the compoſer is at liberty to transfer to the baſs that which he thinks preferable; regard being had to the procedure of that baſs, to the beauty of the melody, and above all to the expreſſion, as may afterwards be explained. In this caſe the real fundamental ſound, inſtead of retaining its natural ſtation, which is in the baſs, will either be transferred to ſome of the other parts, or perhaps even entirely ſuppreſſed, and ſuch a chord is called an *inverted* chord. Fundamental.

In reality, ſays Rameau, a chord inverted does not differ from the chord in its direct and natural order from which it was produced: but as theſe ſounds form different combinations, theſe combinations have long been taken for fundamental chords; different names have been given them, (which may be ſeen at the word ACCORD, in Rouſſeau's Dictionary). Theſe names, by the perſons who beſtowed them, were thought to create and ſanctify their diſtinctions; as if a difference in names could really produce a difference in the ſpecies.

M. Rameau in his Treatiſe of Harmony has ſhown, and M. d'Alembert in his Elements of Muſic has ſtill more clearly evinced, that many of theſe pretendedly different chords were no more than inverſions of one ſingle chord. Thus the chord of the ſixth is no more than the perfect chord of the third transferred to the baſs; by adding a fifth, we ſhall have the chord of the ſixth and fourth. Here there are three combinations of a chord, which only conſiſts of three ſounds; thoſe which contain four ſounds are ſuſceptible of four combinations, ſince each of theſe ſounds may be tranſferred to the baſs. But in adding beneath this another baſs which, under all the combinations of one and the ſame chord, always preſents the fundamental ſound; it is evident, that conſonant chords are reduced to the number three, and the number of diſſonant chords to four. Add to this all the chords by ſuppoſition, which may likewiſe be reduced to the ſame fundamentals, and you will find harmony brought to a degree of ſimplicity in which no perſon could ever hope to ſee it whilſt its rules remained in that ſtate of confuſion where M. Rameau found them. It is certainly, as that author obſerves, an aſtoniſhing occurrence, that the practice of this art could be carried ſo far as it really was, without knowing its foundation; and that all the rules were ſo exactly found, without having diſcovered the principle on which they depended.

After having ſhown what is the fundamental baſs beneath the chords, let us now ſpeak of its procedure, and of the manner in which it connects theſe chords among themſelves. Upon this point the precepts of the art may be reduced to the ſix following rules.

1. The fundamental baſs ought never to ſound any other notes than thoſe of the ſeries or tone in which the compoſer finds himſelf, or at leaſt thoſe of the ſeries or tone to which he chooſes to make a tranſition. This of all the rules for the fundamental baſs is the firſt and moſt indiſpenſable.

2. By the ſecond, its procedure ought to be ſo implicitly ſubjected to the laws of modulation, as never to ſuffer the idea of a former mode to be loſt till that of a ſubſequent one can be legitimately aſſumed; that is to ſay, that the fundamental baſs ought never to be devious, or ſuffer us to be one moment at a loſs in what mode we are.

3. By the third, it is ſubjected to the connexion of chords and the preparation of diſſonances: a manœuvre which, as we ſhall afterwards ſee, is nothing elſe but a method of producing this connexion, and which of conſequence is only neceſſary when the connexion cannot ſubſiſt without it. See CONNEXION, PREPARATION.

4. By the fourth, it is neceſſitated, after every diſ-

Fundamental. ſonance, to purſue that career which the reſolution of the diſſonance indiſpenſably preſcribes. See RESOLUTION.

5. By the fifth, which is nothing elſe but a conſequence of the former, the fundamental baſs ought only to move by conſonant intervals; except alone in the operation of a broken cadence, or after a chord of the ſeventh diminiſhed, where it riſes diatonically. Every other motion of the fundamental baſs is illegitimate.

6. By the ſixth, in ſhort, the fundamental baſs or harmony ought not to be ſyncopated; but to diſtinguiſh the bars and the times which they contain, by changes of chords properly marked with cadences; in ſuch a manner, for inſtance, that the diſſonances which ought to be prepared may find their preparation in the imperfect time, but chiefly that all the repoſes may happen in the perfect time. This ſixth rule admits of an infinite number of exceptions; but the compoſer ought however to be attentive to it, if he would form a muſic in which the movements are properly marked, and in which the bars may end gracefully.

Wherever theſe rules are obſerved, the harmony ſhall be regular and without fault: this, however, will not hinder the muſic from being deteſtable. See COMPOSITION.

A word of illuſtration on the fifth rule may not be uſeleſs. Whatever turn may be given to a fundamental baſs, if it is properly formed, one of theſe alternatives muſt always be found; either perfect chords moving by conſonant intervals, without which theſe chords would have no connexion; or diſſonant chords in operations of cadence: in every other caſe, the diſſonance can neither be properly placed nor properly reſolved.

From thence it follows, that the fundamental baſs cannot move regularly but in one of theſe three manners: 1ſt, To riſe or deſcend by a third or by a ſixth. 2dly, By a fourth or a fifth. 3dly, To riſe diatonically by means of the diſſonance which forms the connexion, or by a licenſe upon a perfect chord. With reſpect to a diatonic deſcent, it is a motion abſolutely prohibited to the fundamental baſs; or, at moſt, merely tolerated in caſes where two perfect chords are in ſucceſſion, divided by a cloſe expreſſed or underſtood. This rule has no other exception: and it is from not diſcerning the foundation of certain tranſitions, that M. Rameau has cauſed the fundamental baſs to deſcend diatonically under chords of the ſeventh; an operation which is impracticable in legitimate harmony. See CADENCE, DISSONANCE.

The fundamental baſs, which they add for no other reaſon than to ſerve as a proof of the harmony, muſt be retrenched in execution, and often in practice it would have a very bad effect; for it is, as M. Rameau very properly obſerves, intended for the judgment, and not for the ear. It would at leaſt produce a monotony extremely nauſeous by frequent returns of the ſame chord, which they diſguiſe and vary more agreeably by combining it in different manners upon the continued baſs, without reckoning upon the different inverſions of harmony, which furniſh a thouſand means of adding new beauties to the muſic and new energy to the expreſſion. See CHORD, INVERSION.

But it will be objected, If the fundamental baſs is not uſeful in compoſing good muſic, if it muſt even be retrenched in practice, what good purpoſe, then, can it ſerve? We anſwer, that in the firſt place, It ſerves for a rule to ſcholars, upon which they may learn to form a regular harmony, and to give to all the parts ſuch a diatonic and elementary procedure as is preſcribed them by that fundamental baſs. It does more, as we have already ſaid: it proves whether a harmony already formed be juſt and regular; for all harmony which cannot be ſubjected to the teſt of a fundamental baſs, muſt according to all rules be bad. Finally, It ſerves for the inveſtigation of a continued baſs under a given air: though, in reality, he who cannot directly form a continued baſs will ſcarcely be able to form a fundamental baſs, which is better; and much leſs ſtill will he be able to transform that fundamental baſs into a legitimate continued baſs. Theſe which follow are, however, the principal rules which M. Rameau preſcribes for finding the fundamental baſs of a given air. Fundamental.

1. To aſcertain with preciſion the mode in which the compoſer begins, and thoſe through which he paſſes. There are alſo rules for inveſtigating the modes; but ſo long, ſo vague, ſo incomplete, that with reſpect to this, the ear may be formed long before the rules are acquired; and the dunce who ſhould try to uſe them would gain no improvement but the habit of proceeding always note by note, without even knowing where he is.

2. To try in ſucceſſion under each note the principal chords of the mode, beginning by thoſe which are moſt analogous, and paſſing even to the moſt remote, when the compoſer ſees himſelf under a neceſſity of doing ſo.

3. To conſider whether the chord choſen can ſuit the upper part in what precedes and in what follows, by a juſt fundamental ſucceſſion; and when this is impracticable, to return the way he came.

4. Not to change the note of the fundamental baſs till after having exhauſted all the notes which are allowed in ſucceſſion in the upper part, and which can enter into its chord; or till ſome ſyncopated note in the air may be ſuſceptible of two or a greater number of notes in the baſs, to prepare the diſſonance which may be afterwards reſolved according to rule.

5. To ſtudy the intertexture of the phraſes; the poſſible ſucceſſion of cadences, whether full or avoided; and above all, the pauſes which for ordinary return at the end of every four, or of every two bars, ſo that they may always fall upon perfect and regular cadences.

6. In ſhort, to obſerve all the rules formerly given for the compoſition of the fundamental baſs.—Theſe are the principal obſervations to be made for finding one under any given air; for there are ſometimes ſeveral different ones which may be inveſtigated. But, whatever may be ſaid to the contrary, if the air has accent and character, there is only one juſt fundamental baſs which can be adapted to it.

After having given a ſummary explication of the manner in which a fundamental baſs ſhould be compoſed, it ſhould remain to ſuggeſt the means of tranſforming it into a continued baſs; and this would be eaſy, if it were only neceſſary to regard the diatonic procedure and the agreeable air of this baſs. But let

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Fundamental || Funeral.

us not imagine that the baſs, which is the guide and ſupport of the harmony, the ſoul, and as it were the interpreter of the air, ſhould be limited to rules ſo ſimple: there are others which depend upon principles more certain and more radical; fruitful, but latent principles, which have been felt by every artiſt of genius, without having been detected by any one. Rouſſeau hopes, that in his letter upon French muſic he inſinuated this principle. For thoſe who underſtand him, he imagines he has ſaid enough concerning it, and can never ſay enough of it for thoſe who do not. See *Rouſſeau's Miſcellanies*, vol. ii. p. 1.

He does not here mention the ingenious ſyſtem by M. Serre of Geneva, nor his double fundamental baſs; becauſe the principles which, with a ſagacity meritorious of praiſe, he had half detected, have afterwards been unfolded by M. Tartini, in a work of which Rouſſeau has given an account in his article SYSTEM.

FUNDI, in *Ancient Geography*, a town of Latium, on the Via Appia, near Cajeta; enjoying all the privileges of Roman citizens, except the right of ſuffrage and of magiſtracy. Now *Fondi*; a city of Naples, on the confines of the pope's dominions. E. Long. 14. 20. N. Lat. 41. 35.

FUNDY, a bay of conſiderable extent in North America, opening between the iſlands of Penobſcot bay, in the county of Lincoln, and Cape Sable, the ſouth-weſt point of Nova Scotia. It reaches about 200 miles in a north-eaſt direction, and forms a very narrow iſthmus with Verte bay, which reaches into the land in a ſouth-weſt direction from the ſtraits of Northumberland. It is 12 leagues from St John's in New Brunſwick, to the Gut of Annapolis in Nova Scotia, where the tides are remarkably rapid, and riſe to the height of 30 feet. The tides in this bay are ſo rapid, that it is ſaid, they will overtake animals feeding on the ſhore.

FUNEN, or FIONIA, a conſiderable iſland in Denmark, ſeated on the Baltic ſea, and ſeparated from Jutland by a ſtrait called the *Leſſer Belt*, and from the iſland of Zealand by another called the *Great Belt*. It is fertile in wheat and barley; and abounds in cattle, horſes, game of all ſorts, and fiſh. Odenſee is the capital town.

FUNERAL RITES, ceremonies accompanying the interment or burial of any perſon. The word is formed of the Latin *funus*; and that of *funalia*, on account of the torches (which were *funes cera circumdati*) uſed in the funerals of the Romans; though others derive *funus* from the Greek φονος, *death* or *ſlaughter*.

Theſe rites differed among the ancients according to the different genius and religion of each country.

The firſt people who ſeem to have paid any particular reſpect to their dead, were the Egyptians, the poſterity of Ham, the firſt cultivators of idolatrous worſhip and ſuperſtition after the flood; they were alſo the firſt who aſſerted the immortality of the ſoul, its migration into all kinds of animals in earth, air, and ſea, and its return to the human body; which they ſuppoſed to be within the term of 3000 years: Hence proceeded their very great care in embalming of their dead bodies, and their being at ſuch vaſt expences, as they were, in building proper repoſitories for them; for they were more ſolicitous about their graves than their houſes: This gave birth to thoſe wonders of the world, the pyramids, which were built for the burial of their kings, with ſuch vaſt charges, and almoſt incredible magnificence. See PYRAMID. Funeral.

Whenever a perſon died among the *Egyptians*, his parents and friends put on mournful habits, and abſtained from all banquets and entertainments. This mourning laſted from 40 to 70 days, during which time they embalmed the body. See EMBALMING.

When this ceremony was finiſhed, the embalmed body was reſtored to the friends, who placed it in a kind of open cheſt, which was preſerved either in their houſes, or in the ſepulchres of their anceſtors. But before the dead were allowed to be depoſited in the tomb, they underwent a ſolemn judgment, which extended even to their kings. Of this remarkable cuſtom we have a particular account in the firſt book of Diodorus Siculus. "Thoſe who prepare to bury a relation, give notice of the day intended for the ceremony to the judges, and to all the friends of the deceaſed; informing them, that the body will paſs over the lake of that diſtrict to which the dead belonged: when, on the judges aſſembling, to the number of more than 40, and ranging themſelves in a ſemicircle on the farther ſide of the lake, the veſſel is ſet afloat, which thoſe who ſuperintend the funeral have prepared for this purpoſe. This veſſel is managed by a pilot, called in the Egyptian language Charon; and hence they ſay, that Orpheus, travelling in old times into Egypt, and ſeeing this ceremony, formed his fable of the infernal regions, partly from what he ſaw, and partly from invention. The veſſel being launched on the lake, before the coffin which contains the body is put on board, the law permits all, who are ſo inclined, to produce an accuſation againſt it. If any one ſteps forth, and proves that the deceaſed has led an evil life, the judges pronounce ſentence, and the body is precluded from burial; but if the accuſer is convicted of injuſtice in his charge, he falls himſelf under a conſiderable penalty. When no accuſer appears, or when the accuſation is proved to be an unfair one, the relations, who are aſſembled, change their expreſſions of ſorrow into encomiums on the dead; yet do not, like the Greeks, ſpeak in honour of his family, becauſe they conſider all Egyptians as equally well born: but they ſet forth the education and manners of his youth, his piety and juſtice in maturer life, his moderation, and every virtue by which he was diſtinguiſhed; and they ſupplicate the infernal deities to receive him as an aſſociate among the bleſt. The multitude join their acclamations of applauſe in this celebration of the dead, whom they conſider as going to paſs an eternity among the juſt below." Such is the deſcription which Diodorus gives of this funeral judicature, to which even the kings of Egypt were ſubject. The ſame author aſſerts, that many ſovereigns had been thus judicially deprived of the honours of burial by the indignation of their people: and that the terrors of ſuch a fate had the moſt ſalutary influence on the virtue of their kings.

The funeral rites among the *Hebrews* were ſolemn and magnificent. When any perſon was dead, his relations and friends rent their clothes; which cuſtom is but faintly imitated by the modern Jews, who only cut off a bit of their garment, in token of affliction. It was uſual to bend the dead perſon's thumb into the hand, and faſten it in that poſture with a ſtring; becauſe

Funeral. cauſe the thumb then having the figure of the name of God, they thought the devil would not dare to approach it. When they came to the burying place, they made a ſpeech to the dead in the following terms: "Bleſſed be God, who has formed thee, fed thee, maintained thee, and taken away thy life. O dead! he knows your numbers, and ſhall one day reſtore your life," &c. Then they ſpoke the elogium, or funeral oration, of the deceaſed; after which they ſaid a prayer, called the *righteouſneſs of judgment;* then turning the face of the deceaſed towards heaven, they called out, "Go in peace."

Among the ancient *Greeks* it was uſual ſometimes before the interment, to put a piece of money into the mouth of the deceaſed, which was thought to be Charon's fare for wafting the departed ſoul over the infernal river. This ceremony was not uſed in thoſe countries which were ſuppoſed to be ſituated in the neighbourhood of the infernal regions, and to lead thither by a ready and direct road. The corpſe was likewiſe furniſhed with a cake, compoſed of flour, honey, &c. which was deſigned to appeaſe the fury of Cerberus the door-keeper of hell, and to procure the ghoſt a ſafe and quiet entrance. During the time the corpſe continued in the houſe, there ſtood before the door a veſſel of water: the deſign of which was, that thoſe concerned about the body might purify themſelves by waſhing; it being the opinion of the Greeks, as well as of the Jews, that pollution was contracted by touching a dead body.

The ceremonies by which they expreſſed their ſorrow for the death of their friends were various; but it ſeems to have been a conſtant rule to recede as much as poſſible in habit and behaviour from their ordinary cuſtoms. For this reaſon they abſtained from banquets and entertainments; they diveſted themſelves of all ornaments; they tore, cut off, or ſhaved their hair, which they caſt into the funeral pile, to be conſumed with the body of their deceaſed friend. Sometimes they threw themſelves on the ground and rolled in the duſt, or covered their head with aſhes; they beat their breaſts, and even tore their fleſh with their nails, upon the loſs of a perſon they much lamented. When perſons of rank, ſuch as public magiſtrates or great generals died, the whole city put on a face of mourning; all public meetings were intermitted; the ſchools, baths, ſhops, temples, and all places of concourſe, were ſhut up.

After interment followed the *epulæ* or feaſts, at which the company uſed to appear crowned; when they ſpoke in praiſe of the dead, ſo far as they could go with truth, it being eſteemed a notorious wickedneſs to lie upon ſuch an occaſion. And not only at thoſe feaſts, but even before the company departed from the ſepulchre, they were ſometimes entertained with a panegyric upon the dead perſon.

The Grecian ſoldiers, who died in war, had not only their tombs adorned with inſcriptions ſhowing their names, parentage, and exploits, but were alſo honoured with an oration in their praiſe. Particularly the cuſtom among the Athenians in the interment of their ſoldiers was as follows, namely, "They uſed to place the bodies of their dead in tents three days before the funeral, that all perſons might have opportunity to find out their relations, and pay their laſt reſpects to them. Upon the fourth day, a coffin of cypreſs was ſent from every tribe, to convey the bones of their own relations; after which went a covered herſe, in memory of thoſe whoſe bodies could not be found. All theſe, accompanied with the whole body of the people, were carried to the public burying place, called *Ceramicus*, and there interred. One oration was ſpoken in commendation of them all, and their monuments were adorned with pillars, inſcriptions, and all other ornaments uſual about the tombs of the moſt honourable perſons. The oration was pronounced by the fathers of the deceaſed perſons who had behaved themſelves moſt valiantly. Thus after the famous battle at Marathon, the fathers of Callimachus and Cynægyrus were appointed to make the funeral oration. And upon the return of the day, upon which the ſolemnity was firſt held, the ſame oration was conſtantly repeated every year." Funeral.

Interring or laying the dead in the ground ſeems to have been the moſt ancient practice among the Greeks; though burning came afterwards to be generally uſed among them. It was cuſtomary to throw into the funeral pile thoſe garments the deceaſed uſually wore. The pile was lighted by one of the deceaſed's neareſt relations or friends, who made prayers and vows to the winds to aſſiſt the flames, that the body might quickly be reduced to aſhes; and during the time the pile was burning, the dead perſon's friends ſtood by it, pouring libations of wine, and calling upon the deceaſed.

The funeral rites among the *ancient Romans* were very numerous. The deceaſed was kept ſeven days; and every day waſhed with hot water, and ſometimes with oil, that, in caſe he were only in a ſlumber, he might be thus waked; and every now and then his friends meeting, made a horrible outcry or ſhout, with the ſame view; which laſt action they called *conclamatio*. The third conclamation was on the ſeventh day; when, if no ſigns of life appeared, the defunct was dreſſed and embalmed by the pollinctores; placed in a bed near the door, with his face and heels towards the ſtreet; and the outſide of the gate, if the deceaſed were of condition, was garniſhed with cypreſs boughs. In the courſe of theſe ſeven days, an altar was raiſed near his bed ſide, called *acerra;* on which his friends every day offered incenſe: and the libitinarii provided things for the funeral.

On the ſeventh day a crier was ſent about the city, to invite the people to the ſolemnization of the funeral in theſe words: *Exequias L. Tit. filii, quibus eſt commodum ire, jam tempus eſt. Ollus* (i. e. *ille*) *ex ædibus effertur.* The people being aſſembled, the laſt conclamation ended, and the bed was covered with purple: a trumpeter marched forth, followed by old women called *præficæ*, ſinging ſongs in praiſe of the deceaſed: laſtly, the bed followed, borne by the next relations; and if the perſon were of quality and office, the waxen images of all his predeceſſors were carried before him on poles. The bed was followed by his children, kindred, &c. *atrati*, or in mourning: from which act of following the corpſe, theſe funeral rites were called *exequiæ*. The body thus brought to the roſtra, the next of kin *laudabat defunctum pro roſtris*, made a funeral oration in his praiſe and that of his anceſtors. This done, the body was carried to the *pyra*, or funeral pile, and there burnt; his friends firſt cutting off a finger, to be buried

Funeral. ried with a second solemnity. The body consumed, the ashes were gathered; and the priest sprinkling the company thrice with clean water, the eldest of the *præficæ* crying aloud, *Ilicet*, dismissed the people, who took their leave of the deceased in this form, *Vale, vale, vale: nos te ordine quo natura permiserit sequemur.* —The ashes, enclosed in an urn, were laid in the sepulchre or tomb.

The *ancient Christians* testified their abhorrence of the Pagan custom of burning their dead; and always deposited the body entire in the ground: and it was usual to bestow the honour of embalming upon the martyrs at least, if not upon others. They prepared the body for burial by washing it with water, and dressing it in a funeral attire. The exportation or carrying forth of the body was performed by near relations, or persons of such dignity as the circumstances of the deceased required. Psalmody, or singing of psalms, was the great ceremony used in all funeral processions among the ancient Christians.

In the *Romish church*, when a person is dead, they wash the body, and put a crucifix in its hand. At its feet stands a vessel full of holy water, and a sprinkler, that they who come in may sprinkle both themselves and the deceased. In the mean time some priest stands by the corpse, and prays for the deceased till it is laid in the earth. In the funeral procession, the exorcist walks first, carrying the holy water; next the cross-bearer, afterwards the rest of the clergy, and last of all the officiating priest. They all sing the *miserere*, and some other psalms; and at the end of each psalm a *requiem*. We learn from Alet's ritual, that the faces of deceased laymen must be turned towards the altar, when they are placed in the church; and those of the clergy towards the people. The corpse is placed in the church surrounded with lighted tapers; after the office for the dead, mass is said; then the officiating priest sprinkles the corpse thrice with holy water, and as often throws incense on it. The body being laid in the grave, the friends and relations of the deceased sprinkle the grave with holy water.

The funeral ceremonies of the *Greek church* are much the same with those of the Latin. It needs only be observed, that, after the funeral service, they kiss the crucifix, and salute the mouth and forehead of the deceased; after which each of the company eats a bit of bread and drinks a glass of wine in the church, wishing the soul a good repose, and the afflicted family all consolation.

FUNERAL Games, a part of the ceremony of the ancient funerals.

It was customary for persons of quality among the ancient Greeks and Romans, to institute games with all sorts of exercises, to render the death of their friends more remarkable. This practice was generally received, and is frequently mentioned by ancient writers. Patroclus's funeral games take up the greatest part of one of Homer's Iliads; and Agamemnon's ghost is introduced by the same poet, telling the ghost of Achilles, that he had been a spectator at a great number of such solemnities.

The celebration of these games among the Greeks mostly consisted of horse races; the prizes were of different sorts and value, according to the quality and magnificence of the person that celebrated them. The garlands given to victors on this occasion were usually of parsley, which was thought to have some relation to the dead. Funeral.

Those games, among the Romans, consisted chiefly of processions; and sometimes of mortal combats of gladiators around the funeral pile. They, as well as the Greeks, had also a custom, though very ancient, of cutting the throats of a number of captives before the pile, as victims to appease the manes of the deceased. Cæsar relates, that the Gauls had this custom.

The funeral games were abolished by the emperor Claudius.

FUNERAL Oration, a discourse pronounced in praise of a person deceased, at the ceremony of his funeral.

This custom is very ancient. In the latter part of the account above given of the Egyptian ceremonies of interment, may be perceived the first rudiments of funeral orations, and what was the subject of them, which were afterwards moulded into a more polite and regular form by other nations, who adopted this custom. Nor can we omit remarking, that those funeral solemnities were attended not only with orations in praise of the deceased, but with prayers for him: which prayers, it seems, were made by one who personated the deceased: an entire form of one of them is preserved by Porphyry, and perhaps it may in some measure gratify the reader's curiosity to recite it from him. "When (says he) they (the Egyptians) embalm their deceased nobles, they privately take out the entrails, and lay them up in an ark or chest: moreover, among other things which they do in favour of the deceased, lifting up the ark or chest to the sun, they invoke him; one of the *libitinarii* making a prayer for the deceased, which Euphantes has translated out of the Egyptian language, and is as follows:—O lord, the sun, and all the gods who give life to men, receive me and admit me into the society of the immortal ones; for, as long as I lived in this world, I religiously worshipped the gods whom my parents showed me, and have always honoured those who begat my body; nor have I killed any man, nor have I defrauded any of what has been committed to my trust, nor have I done any thing which is inexpiable. Indeed, whilst I was alive, if I have sinned either by eating or drinking any thing which was not lawful; not through myself have I sinned, but through these, showing the ark and chest where the entrails were. And having thus spoke, he casts it into the river, but the rest of the body he embalms as pure."

The Grecians received the seeds of superstition and idolatrous worship from the Egyptians, through the coming of Cecrops, Cadmus, Danaus, and Erechtheus, into Greece; and among other customs transplanted from Egypt, were the solemnities used at the burial of the dead. Of these, an encomium on the deceased always formed a part, as particularly noticed under the preceding article.

From the Egyptians and Grecians, especially from the latter, the Romans received many of their laws and customs, as well as much of their polytheism and idolatrous worship. It is well known, that the custom of making funeral orations in praise of the dead obtained among them; and the manner in which their funeral services were performed has been already described. The corpse being brought into their great oratory,

Funeral. oratory, called the *roſtra*, the next of the kin *laudabat defunctum pro roſtris*, that is, made a funeral oration, in the commendation principally of the party deceaſed, but touching the worthy acts alſo of thoſe his predeceſſors whoſe images were there preſent. The account given by Dr Kennet is in theſe words: "In all the funerals of note, eſpecially in the public or indictive, the corpſe was firſt brought with a vaſt train of followers into the forum; here one of the neareſt relations aſcended the roſtra, and obliged the audience with an oration in praiſe of the deceaſed. If none of the kindred undertook the office, it was diſcharged by ſome of the moſt eminent perſons in the city for learning and eloquence, as Appian reports of the funeral of Sylla. And Pliny the younger reckons it as the laſt addition to the happineſs of a very great man, that he had the honour to be praiſed at his funeral by the moſt eloquent Tacitus, then conſul; which is agreeable to Quintilian's account of this matter, *Nam et funebres*, &c. For the funeral orations (ſays he) depend very often on ſome public office, and by order of ſenate are many times given in charge to the magiſtrates to be performed by themſelves in perſon. The invention of this cuſtom is generally attributed to Valerius Poplicola, ſoon after the expulſion of the regal family. Plutarch tells us, that honouring his colleague's obſequies with a funeral oration, it ſo pleaſed the Romans, that it became cuſtomary for the beſt men to celebrate the funerals of great perſons with ſpeeches in their commendations." Thus Julius Cæſar, according to cuſtom, made an oration in the roſtra, in praiſe of his wife Cornelia, and his aunt Julia, when dead; wherein he ſhowed, that his aunt's deſcent, by her mother's ſide, was from kings, and by her father's from the gods. Plutarch ſays, that "he approved of the law of the Romans, which ordered ſuitable praiſes to be given to women as well as to men after death."—Though by what he ſays in another place, it ſeems that the old Roman law was, that funeral orations ſhould be made only for the elder women; and therefore he ſays, that Cæſar was the firſt that made one upon his own wife, it not being then uſual to take notice of younger women in that way: but by that action he gained much favour from the populace, who afterwards looked upon him, and loved him as a very mild and good man. The reaſon why ſuch a law was made in favour of the woman, Livy tells us was this, That when there was ſuch a ſcarcity of money in the public treaſury, that the ſum agreed upon to give the Gauls to break up the ſiege of the city and capitol could not be raiſed, the women collected among themſelves and made it up; who hereupon had not only thanks given them, but this additional honour, that after death, they ſhould be ſolemnly praiſed as well as the men: which looks as if, before this time, only the men had thoſe funeral orations made for them.

This cuſtom of the Romans very early obtained among the Chriſtians. Some of their funeral ſermons or orations are now extant, as that of Euſebius on Conſtantine; and thoſe of Nazianzen on Baſil and Cæſarius; and of Ambroſe on Valentinian, Theodoſius, and others. Gregory, the brother of Baſil, made επικηδειον λογον, a funeral oration, for Melitus biſhop of Antioch: in which orations, they not only praiſed the dead, but addreſſed themſelves to them, which ſeems to have introduced the cuſtom of praying to departed ſaints. Now theſe orations were uſually made before the bodies of the deceaſed were committed to the ground; which cuſtom has been more or leſs continued ever ſince, to this day. Funeral, Fungi.

Thus it appears, that thoſe rites and ceremonies among the heathens, which have been delivered from one people to another, are what have given birth to

FUNERAL Sermons and Orations, among Chriſtians. Though this practice is conſiderably improved, and cleared of many things which would ſmell too rank of paganiſm, and is thrown into a method which, perhaps, may be of ſome ſervice to Chriſtianity; yet, notwithſtanding this new dreſs, its original may very eaſily be diſcerned. The method in which the characters of deceaſed perſons are given in our funeral ſermons, is very much the ſame with that obſerved in thoſe pagan orations; where firſt an account is given of the parentage of the deceaſed, then of his education; after that, we hear of his conduct in riper years: then his many virtues are reckoned up, with his generous, noble, and excellent performances.—Nor let the practice be condemned becauſe of its riſe and original; for why may not the cuſtoms of heathens, if juſt and laudable in themſelves, and nowiſe pernicious to Chriſtianity in their conſequences, be followed by Chriſtians? Only, ſince we are come into this practice, there is one thing we ſhould take care to follow them in; and that is, not to make thoſe ſermons or orations for every one; but for thoſe only whoſe characters are diſtinguiſhed, who have been eminently uſeful in the world, and in the church of Chriſt. The old heathens honoured thoſe alone with this part of the funeral ſolemnity, who were men of probity and juſtice, renowned for their wiſdom and knowledge, or famous for warlike exploits: This, as Cicero * informs us, being part of the law for burials, which directs, that the praiſes only of honourable perſons ſhall be mentioned in the oration. It would be much more agreeable, therefore, if our funeral diſcourſes were not ſo common, and if the characters given of the deceaſed were more juſt; devoid of that fulſome flattery with which they too often abound.

* *De Leg.* l. 2.

FUNGI (from σφογγος, *fungus*), the name of the 4th order of the 24th claſs of vegetables, in the Linnæan ſyſtem; comprehending all thoſe which are of the muſhroom kind, and which in Tournefort conſtitute the 2d, 3d, 4th, 5th, 6th, 7th, and 8th genera of the firſt ſection in the claſs xvii. This order in the Linnæan arrangement, contains 10 genera; and it conſtitutes one of the natural order of plants in the *Fragmenta Methodi Naturalis* of Linnæus. See BOTANY *Index*.

But as the claſſification of this order only has been given under the article BOTANY, we ſhall here detail ſome of the ſpeculations of naturaliſts concerning their nature and mode of production.

The ancients called fungi *children of the earth*, meaning, no doubt, to indicate the obſcurity of their origin. The moderns have likewiſe been at a loſs in what rank to place them; ſome referring them to the animal, ſome to the vegetable, and others to the mineral kingdom.

Meſſrs Wilck and Munchauſen have not ſcrupled to rank theſe bodies in the number of animal productions; becauſe,

Fungi. becauſe, when fragments of them or their ſeeds were macerated in water, theſe gentlemen perceived a quantity of animalcules diſcharged, which they ſuppoſed capable of being changed into the ſame ſubſtance. It was the ancient opinion, that beef could produce bees; but it was reſerved for Meſſrs Wilck and Munchauſen to ſuppoſe, that bees could produce beef. Wilck aſſerts, that fungi conſiſt of innumerable cavities, each inhabited by a polype; and he does not heſitate to aſcribe the formation of them to their inhabitants, in the ſame way as it has been ſaid that the coral, the lichen, and the mucor, were formed. Hedwig has lately ſhown how ill founded this opinion is with reſpect to the lichen; and M. Durande has demonſtrated its falſity with regard to the corallines. "Indeed (ſays M. Bonnet, talking of the animality of fungi) nothing but the rage for paradox could induce any one to publiſh ſuch a fable; and I regret that poſterity will be able to reproach our times with it. Obſervation and experiment ſhould enable us to overcome the prejudices of modern philoſophy; now, that thoſe of the ancient have diſappeared and are forgotten."

It cannot be denied that the muſhroom is one of the moſt periſhable of all plants, and it is therefore the moſt favourable for the generation of inſects. Conſidering the quickneſs of its growth, it muſt be furniſhed with the power of copious abſorption; the extremity of its veſſels muſt be more dilated than in other plants. Its root ſeems, in many caſes, to be merely intended for its ſupport: for ſome ſpecies grow upon ſtones or moveable ſand, from which it is impoſſible that they can draw much nouriſhment. We muſt therefore ſuppoſe, that it is chiefly by the ſtalk that they abſorb. Theſe ſtalks grow in a moiſt and tainted air, in which float multitudes of eggs, ſo ſmall, that the very inſects they produce are with difficulty ſeen by the microſcope. Theſe eggs may be compared to the particles of the byſſus, 100,000 of which, as M. Gleditſch ſays, are not equal to the fourth of a grain. May we not ſuppoſe, that a quantity of ſuch eggs are abſorbed by the veſſels of the fungus, that they remain there, without any change, till the plant begins to decay? Beſides, the eggs may be only depoſited on the ſurface of the plant, or they may exiſt in the water into which they are thrown for examination. Do not we ſee that ſuch eggs, diſperſed through the air, are hatched in vinegar, in paſte, &c. and wherever they find a convenient nidus for their developement? Can it be ſurpriſing then, that the corruption of the muſhroom ſhould make the water capable of diſcloſing certain beings that are really foreign to both?

It is not more eaſy to acquieſce in the opinions of thoſe naturaliſts who place the fungi in the mineral kingdom, becauſe they are found growing on porous ſtones, thence called *lapides fungarii*; which, however, muſt be covered with a little earth, and be watered with tepid water, in order to favour the growth. Such muſhrooms are no more the produce of the ſtone, than the lichen is of the rock to which it adheres, or the moſs of the tree on which it is found. We have only to obſerve the growth of muſhrooms, to be convinced, that this happens by developement, and not by addition or combination of parts as in minerals. The opinion of Boccone, who attributed them to an unctuous matter performing the function of ſeed, and acquiring extenſion by appoſition of ſimilar parts; and that of Moriſon, who conceived that they grew ſpontaneouſly out of the earth by a certain mixture of ſalt and ſulphur, joined with oils from the dung of quadrupeds; have now no longer any adherents. Fungi are produced, they live, they grow, by developement; they are expoſed to thoſe viciſſitudes natural to the different periods of life which characterize living ſubſtances; they periſh and die. They extract, by the extremity of their veſſels, the juices with which they are nouriſhed; they elaborate and aſſimilate them to their own ſubſtance. They are, therefore, organized and living beings, and conſequently belong to the vegetable kingdom. But whether they are real plants, or only the production of plants, is ſtill a matter in diſpute with the ableſt naturaliſts. Fungi.

Some ancient authors have pretended to diſcover the ſeed of muſhrooms; but the opinion was never generally received. Petronius, when he is laughing at the ridiculous magnificence of his hero Trimalcio, relates, that he had written to the Indies for the ſeed of the morelle.

Theſe productions were generally attributed to the ſuperfluous humidity of rotten wood, or other putrid ſubſtances. The opinion took its riſe from obſerving that they grew moſt copiouſly in rainy weather. Such was the opinion of Tragus, of Bauhin, and even of Columna, who, talking of the peziza, ſays, that its ſubſtance was more ſolid and harder, becauſe it did not originate from rotten wood, but from the *pituita* of the earth. It is not ſurpriſing, that, in times when the want of experiment and obſervation made people believe that inſects could be generated by putrefaction, we ſhould find the opinion general, that fungi owed their origin to the putreſcence of bodies, or to a viſcous humour analogous to putridity.

Malpighi could not ſatisfy himſelf as to the exiſtence of ſeeds which other botaniſts had pretended to diſcover. He only ſays, that theſe plants muſt have them, or that they perpetuate themſelves and ſhoot by fragments. Micheli, among the moderns, appears to have employed himſelf moſt ſucceſsfully on this ſubject. He imagined, that he not only ſaw the ſeeds, but even the ſtamina, as well as the little tranſparent bodies deſtined to favour the diſſemination and the fecundation of theſe ſeeds. Before this author, Liſter thought he perceived ſeeds in the *Fungus peroſus craſſus magnus* of John Bauhin: the little round bodies that are found in the peziæ and hevellæ, at that time, paſſed for ſeeds; which did not appear at all probable to Marſigli, conſidering that the eye, when aſſiſted with the very beſt microſcopes, could perceive nothing ſimilar in much larger fungi. Indeed theſe bodies may be the capſules or covers of the ſeeds, if they are not the ſeeds themſelves. However this may be, Marſigli, obſerving that fungi were often without roots or branches, and that they wanted flowers and ſeeds, the means which nature employs for the production of perfect plants, thought himſelf warranted in doubting whether theſe beings could be ranked in the number of vegetables.

The doubts of Marſigli prompted him to obſerve the formation of fungi. Their matrix he called *Situs*: he imagined they grew in places where they met with an unctuous matter, compoſed of an oil mixed with nitrous ſalt, which, by fermentation, produced heat and moiſ-

Fungi. ture, and infinuated itſelf between the fibres of wood; that is, he imagined them to be the production of a viſcous and putreſcent humour. Lanciſi, in like manner, conſidered fungi as owing their exiſtence to the putrefaction of vegetables, and ſuppoſed them a diſeaſe in the plant; but he imagined, "that the fibres of the tree were neceſſary to their production," as is the caſe in the formation of galls; he compared them to the warts and other excreſcences of the human body. He added, that ſuch fungous vegetable tumours muſt neceſſarily aſſume various forms and figures, from the fluids which diſtend the tubes and veſſels relaxed by putreſcence, from the ductility of the fibres and their direction, and from the action of the air.

This opinion has been refuted by the celebrated naturaliſt M. de Juſſieu, in the Memoirs of the Academy of Sciences for the year 1728. He maintains, that the fungi have a great analogy with the lichen, which is allowed to be a vegetable; that, like the lichen, they are diveſted of ſtalk, branches, and leaves; that, like it, they grow and are nouriſhed upon the trunks of trees, on pieces of rotten wood, and on all ſorts of putrid vegetables; that they reſemble the lichen too in the rapidity of their growth, and the facility with which many of them may be dried, and reſtored to their former figure upon being immerſed in water; and, laſtly, that there is a great ſimilarity in the manner in which their ſeeds are produced. He affirms, that only the warts and excreſcences which grow on animal bodies, and the knots and other tumors that are to be found on trees, can be compared with one another; for they are compoſed equally of the ſolid and liquid ſubſtance of the plant or animal on which they grow; whereas, the matter of the fungi is not only quite diſtinct from that of the plants on which they are found, but often entirely ſimilar to the ſubſtance of thoſe that ſpring immediately from the earth.

The organization, ſays M. de Juſſieu, which diſtinguiſhes plants and other productions of nature, is viſible in the fungi; and the particular organization of each ſpecies is conſtant at all times and in all places; a circumſtance which could not happen if there were not an animal reproduction of ſpecies, and conſequently a multiplication and propagation by ſeed. This is not, he ſays, an imaginary ſuppoſition; for the ſeeds may be felt like meal upon muſhrooms with gills, eſpecially when they begin to decay; they may be ſeen with a magnifying glaſs, in thoſe that have gills with black margins; and, laſtly, ſays he, botaniſts can have no doubt that fungi are a diſtinct claſs of plants, becauſe, by comparing the obſervations made in different countries with the figures and the deſcriptions of ſuch as have been engraven, the ſame genera and the ſame ſpecies are everywhere found.

Notwithſtanding this refutation by M. de Juſſieu, another naturaliſt, M. de Necker, has lately maintained, in his work entitled *Mycitologia*, That the fungi ought to be excluded from the three kingdoms of nature, and be conſidered as intermediate beings. He has obſerved, like Marſigli, the matrix of the fungi: and has ſubſtituted the word *carchte* (initium faciens) inſtead of *ſitus*; imagining that the rudiment of the fungus cannot exiſt beyond that point in which the developement of the filaments or fibrous roots is perceived. He allows, that fungi are nouriſhed and grow like vegetables; but he thinks that they differ very much from them in reſpect of their origin, ſtructure, nutrition, and rapidity of growth. He ſays, that the various veſſels which compoſe the organization of vegetables are not to be found in the fungi, and that they ſeem entirely compoſed of cellular ſubſtance and bark; ſo that this ſimple organization is nothing more than an aggregation of veſſels endowed with a common nature, that ſuck up the moiſture in the manner of a ſponge; with this difference, that the moiſture is aſſimilated into a part of the fungus. Laſtly, That the fructification, the only eſſential part of a vegetable, and which diſtinguiſhes it from all other organized bodies, being wanting, fungi cannot be conſidered as plants. This he thinks confirmed by the conſtant obſervation of thoſe people who gather the morelle and the muſhroom, and who never find them in the ſame ſpots where they had formerly grown. As the generation of fungi (ſays M. Necker) is always performed when the parenchymatous or cellular ſubſtance has changed its nature, form, and function, we muſt conclude that it is the degeneration of that part which produces theſe bodies. Fungi.

But if fungi were owing merely to the degeneration of plants, they would be ſtill better entitled to conſtitute a new kingdom. They would then be a decompoſition, not a new formation or new bodies. Beſides, we cannot deny, that in thoſe bodies which form the limit between the animal and vegetable kingdoms, the organization becomes ſimple, as the organs deſtined for nutrition are multiplied: but, as the laſt in the claſs of inſects belongs to the animal kingdom, fungi ought, notwithſtanding the ſimplicity of their organization, ſtill to belong to the vegetable kingdom. The parenchymatous or cellular ſubſtance, which, as Mr Bonnet ſays, is univerſally extended, embraces the whole fibrous ſyſtem, and becomes the principal inſtrument of growth, muſt naturally be more abundant in theſe productions; and this accounts for the rapidity of their enlargement. Beſides, growth, whether ſlow or rapid, never was employed to determine the preſence or abſence of the vegetable or animal character. The *draba verna*, which in a few weeks ſhoots, puts forth its leaves, its flowers, and fruit, is not leſs a plant than the palm. The inſect that exiſts but for a day, is as much an animal as the elephant that lives for centuries. As to the ſeeds of the fungi, it is probable that nature meant to withdraw from our eyes the diſſemination of theſe plants, by making the ſeeds almoſt imperceptible; and it is likewiſe probable that naturaliſts have ſeen nothing but their capſules. Since, however, from the imperfection of our ſenſes, we are unable to perceive theſe ſeeds, ought we to infer that they do not exiſt? Are we authorized to conclude this, becauſe we do not find muſhrooms where we have found them a year before? Undoubtedly not; for the greater part of plants require a particular ſoil, and the ſame mould that this year will foſter a rare plant, will next year allow it to periſh. Neither are we at liberty to deny the exiſtence of theſe ſeeds, becauſe thoſe bodies which have been called their ſeeds, and the fragments or cuttings of the plants themſelves, have not produced others of the ſame ſpecies. Nature ſeems to have reſerved for herſelf the care of diſſeminating certain plants: It is in vain, for inſtance, that the botaniſt

Fungi ‖ Furbiſher.

niſt ſows the duſt found in the capſules of the orchis, which every one allows to be the ſeed. But, after all, what are thoſe parts in the fungi caſually obſerved by naturaliſts, and which they have taken for the parts of fructification? Theſe are quite diſtinct from the other parts; and whatever may be their uſe, they cannot have been formed by a prolongation of the cellular ſubſtance, or of the fibres of the tree on which the fungus grows: they are, therefore, owing, like flower and fruit, to the proper organization of the plant. Theſe plants, therefore, have a particular exiſtence, independent of their putrefying nidus. The gills of certain fungi, which differ eſſentially from the reſt of the plant in their conformation, would be ſufficient to authoriſe this latter opinion. But can putrefaction create an organic ſubſtance?

Nature undoubtedly diſſeminates through the air, and over the ſurface of the earth, innumerable ſeeds of fungi, as well as eggs of inſects. The plant and the animal are excluded, when the nidus or the temperature is favourable for their developement. No fortuitous concourſe, either of atoms or fluids, could produce bodies ſo exquiſitely and ſo regularly organized. It is ſufficient to throw one's eyes on the beautiful plates which Schæffer has publiſhed of them, and compare them, by the glaſs, with the warts and other excreſcences of animals, to be convinced that they have not the ſame origin. The function of the cellular ſubſtance in vegetables muſt be greatly ſuperior to that in animals, if it could produce any thing but deformities.

The greater part of fungi exhibit a configuration much too regular, conſtant, and uniform, to be the effect of chance or putrefaction. As this form is preſerved the ſame in all places where fungi have been found, it follows, that they contain in themſelves the principles of their reproduction. They reſemble the miſletoe, and other paraſitic plants, which are perfectly diſtinct from the trees on which they grow. The fungi, therefore, are organized and living ſubſtances, or true plants. If the manner of their production is unknown, that of ſome inſects is ſo too.

FUNGIBLES, in *Scots Law*, are ſuch things as are eſtimated by number, weight, or meaſure; as coin, butter, ale, &c.

FUNGITÆ, in *Natural Hiſtory*, a kind of foſſil coral, of a conic figure, though ſometimes flatted and ſtriated longitudinally.

FUNGUS, in *Surgery*, denotes any ſpongy excreſcence. See SURGERY *Index*.

FUNNEL *of a* CHIMNEY, the ſhaft or ſmalleſt part of the waſte, where it is gathered into its leaſt dimenſions.

Palladio directs, that the funnels of chimneys be carried through the roof four or five feet at leaſt, that they may carry the ſmoke clear from the houſe into the air. See CHIMNEY.

He alſo adviſes, that chamber chimneys be not made narrower than 10 or 11 inches, nor broader than 15; for if too narrow, the ſmoke will not be able to make its way; and, if too wide, the wind will drive it back into the room.

FUR, or FURR, in commerce. See FURR.

FURBISHER, a perſon who furbiſhes, poliſhes, or cleans arms, as guns, ſwords, piſtols, &c. which is chiefly performed with emery. See the article EMERY. Furbiſher ‖ Furies.

FURCA, in antiquity, a piece of timber reſembling a fork, uſed by the Romans as an inſtrument of puniſhment.

The puniſhment of the furca was of three kinds: the firſt only ignominious, when a maſter, for ſmall offences, forced a ſervant to carry a furca on his ſhoulders about the city. The ſecond was penal when the party was led about the circus, or other place, with the furca upon his neck, and whipped all the way. The third was capital, when the malefactor having his head faſtened on the furca, was whipped to death.

FURCHE', in *Heraldry*, a croſs forked at the ends.

FURETIERE, ANTONY, an ingenious and learned Frenchman, was born at Paris in 1620; and after a liberal education became eminent in the civil and canon law. He was firſt an advocate in the parliament; and afterwards taking orders, was preſented with the abbey of Chalivoy, and the priory of Chuines. Many works of literature recommended him to the public; but what he is chiefly known by and valued for is, his Univerſal Dictionary of the French Tongue, in which he explains the terms of art in all ſciences. He had not, however, the pleaſure of ſeeing this uſeful work publiſhed before his death; which happened in 1688. He was a member of the French academy; and the diſputes and quarrels which he had with certain members of it made a great noiſe in the world.

FURIA, in *Zoology*, a genus of inſects belonging to the order of vermes zoophyta. There is but one ſpecies, viz. the infernalis, which has a linear ſmooth body ciliated on each ſide, with reflexed feelers preſſed to its body. In Finland, Bothnia, and the northern provinces of Sweden, it was not unfrequently that people were ſeized with a pungent pain, confined to a point, in the hand or other expoſed part of the body, which preſently increaſed to a moſt excruciating degree, and hath ſometimes been ſuddenly fatal. This diſorder was more particularly obſerved in Finland, eſpecially about boggy and marſhy places, and always in autumn. At length it was diſcovered that this pain inſtantly ſucceeded ſomewhat that dropped out of the air, and in a moment penetrated and buried itſelf in the fleſh. The Finlanders had tried variety of applications to no purpoſe, until at length a poultice of curds or cheeſe was found the moſt effectual in eaſing the pain: and the event confirmed that the inſect was allured by this application to leave the fleſh; as, on its removal, this worm, no longer than the ſixth of an inch, was found in it, and thus the cauſe of this painful diſeaſe explained. But by what means this creature is raiſed into the air, is as yet unknown

FURIES, in Pagan antiquity, certain goddeſſes whoſe office it was to puniſh the guilty after death. They were three in number: Alecto, Megæra, and Tiſiphone; who were deſcribed with ſnakes inſtead of hair, and eyes like lightning, carrying iron chains and whips in one hand, and in the other flaming torches; the latter to diſcover, and the former to puniſh, the guilty: and they were ſuppoſed to be conſtantly hovering over ſuch perſons as had been guilty of any enormous crime.

Mythologiſts ſuppoſe, that Tiſiphone puniſhed the crimes which ſprang from hatred or anger; Megæra,

Furies || Furnace.

thoſe from envy; and Alecto, thoſe from an inſatiable purſuit after riches and pleaſure. They were worſhipped at Caſina in Arcadia, and at Carmia in Peloponneſus. They had a temple at Athens near the Areopagus, and their prieſts were choſen from amongſt the judges of that court. At Telphuſia, a city in Arcadia, a black ewe was ſacrificed to them.

FURLING, in naval affairs, ſignifies the operation of wrapping up and binding any ſail cloſe to the yard; which is done by hauling upon the clew-lines, bunt-lines, &c. which wraps the ſail cloſe together, and being bound faſt to the yard, the ſail is furled.

FURLONG, an Engliſh long meaſure containing the one-eighth of a mile, and therefore equal to 660 feet, or 220 yards.

FURLOUGH, in the military language, is a licenſe granted by an officer to a ſoldier to be abſent from his duty for a limited time.

FURNACE, is a veſſel or building, for the purpoſe of containing combuſtible materials, whether of coal or wood, and ſo conſtructed that great heat may be produced and concentrated. There is a great variety of furnaces, and they are variouſly conſtructed, according to the views of the operator, and the purpoſes to which they are applied. But in all furnaces there are four things which require to be particularly attended to. 1. To be able to concentrate the heat, and direct it as much as poſſible to the ſubſtances which are to be acted upon. 2. To prevent the diſſipation of the heat after it is produced. 3. To obtain the greateſt quantity of heat from the ſmalleſt quantity of fuel; and 4. To be able to regulate at pleaſure the neceſſary degree of heat, or to have it under proper management.

Requiſites of a good furnace.

To concentrate the heat.

1. To accompliſh the firſt object, namely to concentrate the heat, it is uſual to confine the fire in a chamber or cavity properly conſtructed, furniſhed with a door or opening, by which the fuel is introduced; a grate for ſupporting it, and allowing a free paſſage to the air, as well as for the aſhes to fall through into the cavity below, called the *aſh-pit*. In this way the heat produced by the combuſtion of the fuel is confined by the ſides of the furnace, and ſo concentrated that its force is chiefly ſpent on the ſubſtances incloſed.

To prevent its diſſipation.

2. The diſſipation of the heat is prevented by keeping the door of the furnace ſhut, by conſtructing the chimney no wider than to allow a paſſage for the ſmoke, and placing the ſubſtance to be acted upon in ſuch a manner that the fire may have its full effect as it goes up the chimney.

To produce the greateſt proportion of heat.

3. The third object, which is not the leaſt important, is to produce the greateſt quantity of heat from the ſmalleſt quantity of fuel. In an economical point of view, this object is worthy of the greateſt attention, though it is often difficult to attain it. In this view much depends upon the proportion between the ſpaces between the bars of the furnace, and the wideneſs and height of the chimney. This is obvious from conſidering the circumſtances which regulate the proceſs of combuſtion; for this depends on the current of air paſſing through the combuſtible matter. When the fuel in the furnace is kindled, a certain degree of heat is produced; but without a current of freſh air paſſing through the burning matter, the fire is inſtantly extinguiſhed; and without this ſtream of freſh air the inflammation cannot go on. But when this takes place, the air within the furnace is rarefied, and being no longer a balance for the external air, it is driven up the chimney by a current of denſer air, ruſhing in at the openings. This having paſſed through the fuel, is alſo rarefied, and paſſes off, giving place in its turn to a new current, ſo that in this way there is a conſtant flux of air up the chimney. From this it muſt appear, that the greater the rarefaction of the air in the fire-place is, the greater will be the intenſity of the heat produced. By conſtructing a furnace in a particular way, the heat may be ſo managed that the under part of the chimney may be nearly as ſtrongly heated as the fire-place itſelf; ſo that, although a ſtrong current of air paſſes through the fuel, yet as the heat is uſeleſsly ſpent on the chimney, there is a great and unneceſſary waſte of fuel. To prevent this, there is a contrivance by which the throat of the chimney is occaſionally contracted, by means of a ſliding plate, which, when it is puſhed in, cloſes up the whole vent; but may be drawn out in ſuch a way as to form a larger or ſmaller opening as may be thought neceſſary. Till the fuel is thoroughly kindled, and the furnace fully heated, the plate ſhould be quite drawn out, ſo that the largeſt column of air which the furnace will admit, may paſs through the fuel. The plate is then put in to a certain length, and ſo regulated that the ſmoke may be prevented from iſſuing at the door of the furnace. The current of air increaſes in proportion to the rarefaction of the air in the fire-place, and this increaſes the inflammation of the fuel; and the heat now being reflected from every point of the furnace, excepting the narrow paſſage by which the ſmoke paſſes off, becomes extremely intenſe. If a large quantity of fuel be introduced at once, it will conſume ſlowly, and require little attention, in compariſon with thoſe furnaces where this precaution is not obſerved. When the intenſity of the heat is not very great, the ſliding-plate may be of caſt iron; but to reſiſt great degrees of heat, it will be found more convenient to have it made of fire clay. But it muſt be obſerved, that the advantage derived from the ſliding-plate is loſt to thoſe furnaces which are of a large conſtruction, and where great quantities of metal are to be melted; and there it is commonly found, that the waſte of fuel is very great. Furnace.

Method of regulating the heat.

4. To attain the fourth object, namely, to be able to regulate conveniently the degree of heat, a certain proportion of air only is to be allowed to paſs through the fuel. With this view it is neceſſary to have the command of the furnace below, becauſe the parts above are often filled with ſmall quantities of ſoot. To manage this in the moſt effectual manner, the door of the aſh-pit is to be perfectly cloſed, and furniſhed with a ſeries of round holes which have a certain proportion to each other. In the furnaces conſtructed according to Dr Black's direction, the areas of theſe holes are as 1, 2, 4, 8, 16, &c. in geometrical progreſſion. Seven or eight of theſe in the door of the aſh-pit give a ſufficient command over the fire When the utmoſt intenſity of heat is required, all the paſſages are thrown open, and the height of the chimney is increaſed, ſo that the height of the column of rarefied air being augmented, the motion of the current of air through the fuel is proportionably more rapid, and conſequently the heat of the furnace becomes more intenſe. In the conſtruction of a furnace recommended by Macquer, another tube is applied to the aſh-pit, having the extremity moſt

nace. most distant from the furnace widest, and gradually tapering as it approaches it. By this contrivance, it was proposed to increase the velocity of the current of air as it passes from a wider into a narrower tube. But it is found that the air will not ultimately move with greater velocity than if the tube were not applied. It may indeed be useful where the furnace is placed in a small apartment, and the tube itself forms a communication with the external air.

After these preliminary observations on the general principles of furnaces, we propose in the following treatise to give a short account of the construction and application of some of the more important furnaces which are employed in the arts and manufactures.

But before we enter into the detail and description of particular furnaces, we shall lay before our readers the description of one which was invented by Messrs Robertons of Glasgow, for the purpose of consuming its own smoke, and saving fuel.

nace for uming wn ke. "To construct furnaces (says the editor of the Philosophical Magazine, from which this account is taken), on such a principle as should enable them to consume their own smoke has long been a desideratum; and we believe the public in general, but especially those who have been annoyed by the smoke of steam engines, founderies, and similar erections in their neighbourhood, will be glad to learn that a furnace has been contrived which effectually gains this end.

"The construction is extremely simple, and will be easily understood by the following description, and the plate to which it refers.

Plate XXV. 1. & 2. Fig. 1. represents a vertical section, and fig. 2. a front view of a steam-engine boiler, furnished with one of Messrs Robertons furnaces; and the same letters refer in both to the same parts of the construction.

"The opening A, through which the fuel is introduced into the furnace, is shaped somewhat like a hopper, and is made of cast iron built into the brickwork H, H. From the mouth it inclines downward to the place where the fire rests on the bottom grate B. The coals in this mouth-piece or hopper answer the purpose of a door (A), and those that are lowest are by this means brought into a state of ignition before they are forced into the furnace. Below the lower plate of the hopper K, *e* the furnace is provided with front bars G (B), which not only serve to admit air among the fuel, but offer a ready way to force the fuel back, from time to time, from *c* to *d* (C), to make room for fresh quantities to fall into the furnace from the hopper or mouth-piece. By this arrangement the fuel is brought into a state of ignition before it reaches the farther side of the bottom grate, where it is stopped by the rising breast, *b*, of the brick-work, so that any smoke liberated from the raw coals in the mouth-piece, must pass over these burning coals before it can reach the flue FFF. But this, though it would cause a large quantity of the smoke to be burnt, would not completely prevent the escape and ascent of smoke up the chimney; for it is not merely necessary that the smoke should be exposed to a heat sufficient to ignite it before it escapes: unless, at the same time, a quantity of fresh air, able to furnish a sufficiency of oxygen for the combustion of the smoke, can be brought into contact with it, it will still escape in an undecompосed state. The judicious admission of fresh air, in such a manner that it can reach the smoke, without previously passing through the fire, and parting with its oxygen in its passage, and in such quantity as not to cool the bottom of the boiler, but merely to cause the smoke to burn, constitutes the chief merit of this invention; and to us it appears that it will fully answer the proposed end. Below the upper side of the mouth-piece or hopper, and at about the distance of three-fourths of an inch from it, (this space being a little more or less, according to the size of the furnace), is introduced a cast iron plate *a n*. This plate is above the fuel, and the space between it and the top of the hopper is open for the admission of a thin stream of air, which, rushing down the opening, comes first in contact with that part of the fire which is giving off the greatest part of the smoke, viz. the fuel that has been last introduced, mixes with it before it passes over the fuel in the interior, which is in a high state of combustion, and enables it to inflame so completely, that not a particle of smoke ever escapes undecompосed. Furnace.

"The quantity of air thus admitted to pass over the upper surface of the fire, is regulated by a very simple contrivance. The plate *a n* rests at each end on a stud, or pin, projecting from the cheeks of the mouth-piece A, or is furnished at each end with a pivot which works in the cheeks; the said pins or pivots being placed about midway between the outside and inside of the mouth-piece or hopper, so that, by elevating or depressing the edge *a* of the plate, the opening at *n* is enlarged or diminished. When that degree of opening which produces the best effects are obtained, which is easily known, the plate *a n* is kept in its place by means of a piece of iron introduced above it, and answering the purpose of a wedge.

"Under the grates is the ash-hole I, the upper part of which is furnished with doors SS, which, when shut, prevent the heat from the front bars G from coming out into the apartment, and incommoding the workmen.

"Invited by an advertisement, we went to Messrs Bunnell

(A) "In the management of this furnace, what is chiefly to be attended to is, that the hopper be kept full of coal, and either wholly or in part small coal, to prevent, as much as possible, air getting in by that passage; it is also necessary at some times to use a shutter of thin plate-iron, to be applied to the mouth of the hopper to exclude the entrance of air by that passage.

(B) "These bars are, in fact, a grated door, kept in their position by a catch L, and which may be opened at pleasure for cleaning the fire out. In small furnaces an opening here is all that is necessary; the bars may be dispensed with.

(C) "Between the back end, *d*, of the bottom bars, and the breast brickwork *b*, is represented in the plate a section of a shutter, which is sometimes opened for the purpose of getting out the refuse of the fuel.

Furnace. Bunnell and Silver, Bedford-ſtreet, Covent Garden, to ſee one of theſe furnaces at work, and we were not a little gratified in obſerving that the ſmalleſt appearance of ſmoke could not be perceived iſſuing from the top of the chimney. The advantages of ſuch an improvement can hardly be better illuſtrated than by mentioning what had actually happened with this ſteam engine. The ſmoke, before the improved furnace was employed, incommoded the neighbourhood ſo much, that it was ſtopped as an intolerable nuiſance. Now it is ſo far from diſturbing any one, that, without being admitted to ſee the engine, it would be actually impoſſible to know when it is at work.

"Theſe furnaces, we underſtand, have alſo been adopted by many intelligent manufacturers at Leeds and at Mancheſter. At the latter place, if we may credit newſpaper reports, ſeveral manufacturers have had their works indicted as nuiſances for not having adopted the improvement; the magiſtrates arguing, that, though the welfare of the place required that ſuch inconveniences ſhould be ſubmitted to while no poſſible cure for them was known, the health and comfort of the inhabitants equally demand, now that the evil can be done away, that ſmoking furnaces ſhould not be permitted in the place.

"We earneſtly recommended to owners of ſteam engines, and alſo to thoſe who are annoyed by them, to endeavour to bring this improvement into general uſe. Indeed, we entertain no doubt of its being univerſally adopted ſooner or later; for it yields advantages not only in point of cleanlineſs, comfort, and health, but alſo in point of intereſt; all the ſmoke uſually diſcharged at the top of the chimney, being in fact, ſo much good fuel, that only wanted the contact of freſh air to inflame it under the boiler. It is a fact well known, that the flame which is often ſeen iſſuing from the chimneys of founders, &c. has no exiſtence except at the top of the chimney: while aſcending the flue it is only denſe ſmoke, conſiſting of the azote of the atmoſpheric air decompoſed in paſſing through the fire, of hydrogen, coal tar, and carbonaceous matter, of ſuch a high temperature, that it only wants oxygen to make it inflame ſpontaneouſly: this it obtains from the atmoſpheric air into which it aſcends, and then preſents ſuch appearances as would make a haſty obſerver adopt the opinion that the flame had aſcended, as flame, from the fuel in the furnace; which is by no means the caſe. A conſideration of this ſimple fact will convince any perſon that it is not an inconſiderable proportion of the fuel that is thus waſted. Nor is this the only loſs ſuſtained; the quantity of heat required not merely to render ſuch a portion of the fuel volatile, but to give to it a temperature able to produce the effect of which we have taken notice, is itſelf furniſhed at the expence of an extra and unneceſſary quantity of fuel. The whole waſte in many caſes is, we are perſuaded, not leſs than an eighth of the whole fuel employed."

Furnace for ſmelting iron. One of the moſt important furnaces, particularly for this country, where, although great and eſſential improvements have been made by induſtry and ingenuity, the manufacture is yet in its infancy, is that for the ſmelting of iron.

We ſhall therefore enter more fully into the detail of the hiſtory, conſtruction, and general principles of the operation of blaſt furnaces; and in tracing their progreſſive hiſtory, it may be obſerved, that in this country it has experienced a revolution, of which no analogous inſtance has occurred in other countries. Furnace.

History In the early and barbarous periods of ſociety, before the introduction of agriculture, the ſurface of a country is uſually covered with extenſive foreſts. From this circumſtance wood, as being moſt acceſſible, abundant, and of eaſieſt application, is uſually employed by mankind for the purpoſes of fuel. In the progreſs of population and improvement, other advantages were derived from the general uſe of wood as fuel; and among theſe the improvement of the climate, and clearing land for the purpoſes of agriculture, were none of the leaſt. The application of wood as fuel to different manufactories, had no doubt alſo an early origin; and in the manufacture of iron, if conducted on a ſcale of any extent, the demand for fuel of this kind muſt have been very great. If, then, during the gradual improvement and proſperity of this country, this manufacture, in place of remaining ſtationary, or declining, from diminiſhed conſumption, has increaſed in capital and extent, without ſome ſubſtitute for wood, the art would have been long before this time entirely loſt, becauſe it depended on a ſtock which muſt have rapidly declined, and even its very exiſtence was often far from being compatible with the views and intereſt of landholders. Such were the circumſtances in which Great Britain was placed, from the reign of Charles II. to the middle of the 18th century. During this period, being in a proſperous ſtate, the manufactures and commerce of the country increaſed the demand for iron, while the ſupply of wood, one of the moſt neceſſary materials in its manufacture, was greatly diminiſhed. It is true, indeed, that, previous to this period, pit-coal had been employed as a ſubſtitute; but the prejudice of ſome, and the ſelfiſh views of others, and eſpecially the want of ſufficient mechanical powers, obſtructed the progreſs of this mode of manufacture. When, however, theſe difficulties were ſurmounted, and it was found that the change of fuel in the blaſt furnace was likely to prove beneficial, this manufacture acquired new vigour, and improvements ſucceeded each other in rapid ſucceſſion. In a period of about 50 years, a complete revolution was effected, not only in relinquiſhing the mode of making iron with charcoal and in employing pit-coal in the blaſt furnace, but alſo in the immenſe increaſe of the manufacture.

At what period the manufacture of iron commenced and progreſs of, in Britain. in Britain, cannot be preciſely aſcertained. It has, however, been ſuppoſed, that the Phœnicians, who wrought the tin mines of Cornwall, may have introduced into the country men who were ſkilled in metallic ores, and were capable of eſtimating their value, by converting theſe mineral riches to ſuch purpoſes as their own neceſſities, or the wants of the inhabitants, might require. It is probable alſo, that the invaſion of England by the Danes, and their eſtabliſhment in this country, added ſomething to their former knowledge in the art of mining and manufacturing the ores of iron. In ſupport of this conjecture, the large heaps of ſcoria found in many parts of England, and having a conſiderable thickneſs of ſoil upon them, have been denominated from time immemorial, "Danes cinders;" and indeed ſo early as the year 1620, large oaks were found in a ſtate of decay, upon the tops of ſome of thoſe hills

of

Furnace. of ſcoria. But although theſe may have been very ancient manufactures, it is the leſs probable that the production of theſe cinders is to be aſcribed to the blaſt furnace; for at that remote period the manufacture was chiefly directed to the fabrication of ſmall portions of malleable iron, in what were called foot-blaſts and bloomeries. The art of caſting or moulding in iron was either altogether unknown, or in ſo rude a ſtate, that it could not be proſecuted with much proſpect of advantage. Pig or caſt iron, if it was at all produced, was then of the moſt refractory nature for being converted into malleable iron. It was not till a future period, when improvements had been made in machinery, and the advantages of a diviſion of labour were known, that different furnaces were conſtructed; one for manufacturing pig iron, and another for converting it into malleable iron. To this the blaſt furnace ſeems to have owed its exiſtence, and it is to be conſidered as an improvement of the advantages which are derived from a diviſion of labour. The blaſt furnaces being excluſively appropriated to the making of pig iron, the attentive manufacturer would ſoon perceive that the products of the furnace were often different from each other. Repeated obſervation and experience would enable him to aſcertain what was the cauſe of this difference. Obſerving that an additional quantity of fuel rendered the forged pig iron more fuſible, this circumſtance would ſuggeſt the practicability of caſting it into ſhape. Hence probably aroſe the art of moulding, which afterwards, as well as the bar-iron forge, became an appendage to the blaſt furnace. After this new manufacture became familiar, the advantage of dividing the product of the blaſt furnace into gray melting iron, or into forged pigs, according to the demand, would be obvious.

Number of furnaces in England. In the year 1615, according to Dudley, who has ſtated the fact in his *Metallum Martis*, there were no leſs than 300 blaſt furnaces in England for ſmelting iron ore with charcoal, and each furnace was ſupplied with fuel upon an average of 40 weeks in the year. Taking the average produce of pig iron at each furnace of 15 tons per week, or 600 tons per annum, the total annual quantity will amount to 180,000 tons, which is a greater quantity than has ever been produced in Britain ſince that period. It is ſuppoſed that this quantity may be greatly exaggerated, but at the ſame time it is allowed that the iron manufacture was, at this early period, highly proſperous and productive. But in the progreſs of agriculture and the increaſe of population, it was neceſſary to clear the land for the purpoſe of cultivation. From this circumſtance, as well as from the great conſumption of wood for the navy, the ſupply of fuel was greatly diminiſhed; ſo that the iron manufacture became conſequently leſs productive.

Pit-coal firſt uſed. It is curious to remark that, although pit-coal was known long before this period, and was wrought at Newcaſtle previous to the year 1272, and great quantities of it were annually exported to Holland and the Low Countries, and was uſed in the ſmith's forge, and other manufactures which require a ſtrong continued heat, yet in England the prejudice againſt its uſe in the manufacture of caſt iron was ſo inveterate, that when it was firſt propoſed and attempted, every obſtacle which could be deviſed was thrown in its way. During the reign of James I. ſeveral patents were granted for the excluſive privilege of manufacturing iron with pit-coal. None of the adventurers, however, ſucceeded in their attempts till the year 1619, when Dudley made pig-iron in a blaſt furnace, but produced only three tons in the week. At this time the price of iron had riſen, in conſequence of many of the iron works having ſtopped for want of wood as fuel. To thoſe manufacturers, therefore, who could ſtill be furniſhed with a ſupply of wood, the manufacture was highly profitable, ſo that they oppoſed any new attempt by which the price of iron was likely to be diminiſhed. Furnace.

After this period, the progreſs of the iron manufacture was greatly interrupted from other cauſes. Amidſt the diſtraction occaſioned by the civil wars which raged in England, little improvement was to be expected. It appears, however, that patents were granted during the Commonwealth, for the excluſive privilege of manufacturing iron in the new way; and in one of theſe, it was believed at the time, that the Protector himſelf had a ſhare. All theſe experienced the fate of the former, and no manufacture of any extent was ſucceſsfully eſtabliſhed. In the year 1663, Dudley in his application for his laſt patent, ſtated that he could produce at one time ſeven tons of pig iron in the week with a furnace of an improved conſtruction, 27 feet ſquare, and with bellows which one man, without much fatigue, could work for an hour.

Thus, as the demand for wood for the purpoſes of fuel in this manufacture increaſed, and the growth of timber was greatly diminiſhed, the manufacturer was forced by neceſſity to have recourſe to the uſe of pit-coal; and when various valuable improvements had been made on machinery, and particularly when the beneficial effects of the ſteam engine had been aſcertained, the iron manufacturer ſaw himſelf in poſſeſſion of a command of power in the management of his materials, of which he had formerly no conception. The ſmall furnace ſupplied with air from bellows conſtructed of leather, which was moved by means of oxen, horſes, or men, went into diſuſe, when larger furnaces were introduced, with an increaſe of the column of air, for the purpoſe of exciting combuſtion. But at this period, when the manufacture derived new vigour from the introduction of the ſteam engine, and the general improvement in machinery, it ſeemed, from the operation of other cauſes, and particularly from the deficiency of fuel, to decline rapidly. The demand for iron in the manufactured ſtate, and particularly for bar iron, had increaſed, while the quantity produced gradually diminiſhed. Recourſe was now had to foreign markets for a ſupply, and the importation of Ruſſian and Swediſh iron then commenced. Of the 300 blaſt furnaces ſpoken of by Dudley, 59 only exiſted; and eſtimating their annual produce at about 295 tons to each furnace, the total amount did not much exceed 17,000 tons.

Such was the ſtate of the manufacture of iron in England and Wales, before the introduction of pit-coal; and thus it appears, that in a period of from 100 to 130 years, it had ſuffered a diminution of more than 50,000 tons annually. It proved of ſingular benefit to this manufacture, that the ſteam engine, which had then become a powerful machine, was introduced, for the purpoſe of raiſing and compreſſing the air, and could be employed in thoſe places where materials were abundant, but where there was a deficiency of water for moving the machinery. Beſides, experience now taught

the

Furnace. the manufacture, that the produce of his furnace could be increaſed by enlarging the diameter of the ſteam cylinder, for rendering the vacuum under the piſton more perfect; and it was ſoon found that, by increaſing theſe effects, ſuch a quantity of pig iron could be produced from the coak of pit-coal, as would be attended with a ſuitable profit. It is ſcarcely to be wondered at, that this circumſtance ſhould have long remained a ſecret; for a ſmall quantity of air only being neceſſary to ignite the charcoal furnace, whether it aroſe from the peculiar inflammability of the fuel, or the ſmall capacity of the furnace, it was always under the eye of the manufacturer, and he would more frequently experience the inconveniences of overblowing than underblowing the furnace. It ſeems too extremely probable, that pit-coal, being conſidered in every reſpect inferior to charcoal, the manufacturer would proceed with great caution in enlarging the column of air, or increaſing its denſity; and thus the advantages to be derived from its uſe would be in a great meaſure loſt. When, however, experience had taught them a different leſſon, the limits to the quantity of air that might be directed to a coak blaſt furnace, before any injurious effects aroſe, were not very obſervable. It was found, indeed, that the denſity of air diminiſhed the quantity of the produce, and the ſame law ſeemed to hold with regard to pit-coal as well as to wood,—that the ſofter qualities might be overblown, while the ſtrata of a denſer and more compact conſiſtence remained undiminiſhed before a heavier blaſt.

Comes into general uſe. Between the years 1750 and 1760 the coak of pit-coal was pretty generally ſubſtituted for charcoal, in the blaſt furnace. The iron manufacture aſſumed new vigour, and in a period of 30 years it experienced in England and Wales a very remarkable progreſs. From the general and increaſing uſe of pit-coal, it is probable that many of the charcoal works were ſooner relinquiſhed than they would otherwiſe have been. The hiſtory of the celebrated foundery of Carron in Scotland, affords us a curious inſtance of the progreſs of the uſe of pit-coal in this manufacture. Theſe extenſive operations commenced about the year 1760. The blowing, as was the practice at the time, was performed by means of large bellows, moved by a water wheel. But as there was a ſcanty ſupply of air, and as this was deficient in denſity, the weekly produce of the furnace rarely exceeded 10 or 12 tons, and often in ſummer this quantity was conſiderably diminiſhed. With a view to improve the operation, immenſe quantities of wood charcoal were prepared, and it was found that the proceſs of ſmelting ſucceeded much better with this kind of fuel than with the mineral coal which was dug out in the neighbourhood. But in the improvement of machinery, more effectual means were diſcovered to procure a blaſt of ſufficient force and denſity for the ignition of pit coal, wheels of greater power were conſtructed; the uſe of the bellows was relinquiſhed, and in their place large iron cylinders, ſo contrived as to blow both up and down, were introduced. Thus, a larger column of air, of three or four times the former denſity, was obtained, and the beneficial effects ariſing from the improvements were ſoon perceived; for the ſame furnace which formerly produced 10 or 12 tons in the week, ſometimes yielded 40 tons in the ſame time; and on an annual average, not leſs than 15,000 tons of metal. Furnace.

About the end of the reign of Queen Elizabeth, we are informed by Dudley, that blaſt furnaces had been conſtructed on ſo large a ſcale, and with ſuch a power of machinery, as to yield a daily produce of more than two tons of charcoal iron; but it is probable that ſo large a produce could only be obtained in ſituations where there was a copious ſupply of water, and where the water wheels and bellows employed were of large ſize. In the more ordinary modes of conducting this proceſs, furnaces of a much ſmaller ſize were employed, and theſe received the ſupply of air from hand bellows which were moved by men, and ſometimes by cattle. From the ſuperiority of the manufacture of iron guns, mortars, &c. England poſſeſſed at this time a conſiderable export trade; but as pit-coal had not yet been applied to any departments in the manufacture of iron, it ſeems probable that theſe articles were caſt from the large blaſt furnaces, becauſe the flame of wood, comparing it with that of pit-coal, poſſeſſing but feeble effects, would render the application of the reverberating furnace (if it was then known), of no uſe in the caſting of guns and mortars. The want of pit-coal in every department of the foundery, greatly retarded the perfection to which the art of moulding might have arrived, and even obſtructed its improvement. The backward ſtate in which the art of caſting and moulding long remained in this country, ſhewed that the want of this material of the ſmelting fuel in the blaſt furnace was long ſevcrely felt; and owing to this, other nations, who in many other reſpects enjoyed fewer advantages, made more rapid progreſs in the improvement of this manufacture. Before this period, it is not improbable that the uſe of pit-coal might have been ſuggeſted to the manufacturer, and that this material, employed as a fuel, might have been conſidered as an auxiliary, or as a ſubſtitute in various departments of the proceſs. The inflammability of this ſubſtance, and its tendency to be converted into a cinder, as well as the general decay of wood, would afford ſufficient ground for what might be conſidered by many as a uſeleſs ſpeculation. The benefits of this manufacture as it then ſtood, had been carefully inveſtigated, and fully appreciated by thoſe who were intereſted in it. The ſupply of wood only ſeemed to limit its extent, but for want of a ſufficient ſupply of materials, the eſtabliſhment of new works became impracticable, thoſe already engaged in the buſineſs were anxious to preſerve the ſupply they enjoyed, however limited, rather than encourage any innovation or change in the proceſs, which, by the ſubſtitution of pit-coal for charcoal from wood, would probably give to new adventurers and ſpeculators a ſuperiority of the market. Beſides, many of the furnaces which were then going, were at a great diſtance from pit-coal, ſo that the general uſe of this ſubſtance, and the advantages to be derived from it, would be highly injurious to their intereſts.

Such was the ſtate of this manufacture when the uſe of pit-coal in this proceſs was diſcovered, or when it was propoſed to employ it for this purpoſe. With this view, James I. in the year 1612, granted a patent to Simon Sturtevant, for the excluſive manufacture of iron with pit-coal, for the period of 31 years. In obtaining this privilege,

Furnace. privilege, the patentee obliged himſelf to publiſh a full account of his diſcoveries, and this appeared in a work in quarto, under the title of "Metallica." It appears, however, that Sturtevant had not ſucceeded in his ſchemes; for in the following year he gave up his privilege, but it is not known to what cauſes the failure is to be aſcribed.

Other adventurer. After Sturtevant, a John Ravenſon, embarked in the ſame hazardous undertaking; and although he procured a patent without much trouble, he had ſoon to encounter difficulties in the way of ultimate ſucceſs, analogous to thoſe which had prevailed over the perſeverance of Sturtevant, and induced him to relinquiſh the farther proſecution of his ſchemes. He obtained his patent on conditions ſimilar to thoſe on which his predeceſſor procured it, in conſequence of which he publiſhed his "Metallica" in 1613. All his ſucceſſors were like him, obliged to reſign their patents from the want of adequate ſucceſs.

Dudley obtains a patent. Dudley procured his patent in the year 1619, and notwithſtanding he affirmed that he manufactured not more than three tons per week, he found it a lucrative undertaking. This diſcovery he brought to perfection at the works of his father in Worceſterſhire; but by the influence of thoſe who wiſhed to ſhare in the emoluments ariſing from the manufacture of iron with pit-coal, his patent was limited to 14 inſtead of 31 years. He informs us himſelf, that, during the greater part of this period, he was enabled to ſell pig and bar iron much cheaper than any of his competitors; but as his remarkable ſucceſs drew their envy upon him, his devoted works were at length deſtroyed by a lawleſs mob, urged on, it is ſuppoſed, to perpetrate ſo atrocious a deed by his rivals in buſineſs. In this unmerited treatment of the ſanguine but unfortunate Dudley, the coke pig proceſs unqueſtionably experienced an irreparable loſs. He had ſo many rivals to contend with, by virtue of the original ground he occupied as a manufacturer, and his attachment to the cauſe of royalty was ſo ſincere, that his improvements were effectually prevented from arriving at laſting or general utility. Could he have procured a new patent after the reſtoration, there is little doubt but he would have again entered with avidity on the laborious paths of diſcovery. In petitioning for the recovery of his ancient privileges, we find him declaring that inſtead of three, he was enabled to manufacture ſeven tons per week of coke pig iron, in conſequence of a large furnace, and an improved bellows.

Attempts to hide it. To ſtand clear as much as poſſible of the method of operation which Dudley had diſcovered, one Captain Buck, Major Wildman, and ſome others, conſtructed large air-furnaces in the foreſt of Dean, into which they put clay pots, for containing the requiſite preparations of ore and charcoal. Pit-coal was employed for the purpoſe of heating the furnaces; and it is highly probable that theſe new adventurers were ſanguine enough to believe that, by tapping the pots below, the ſeparated metal would flow out. This ſtrange method of aſſaying was ſoon found impracticable; for the heat was not of ſufficient intenſity to produce an entire ſeparation; the pots gave way, and the proſecution of this ridiculous ſcheme was ſpeedily relinquiſhed.

The manufacture of iron received no farther improvements for about a century after this period. It was found to be practicable; but how to procure ſuch a quantity as to produce a lucrative return, was not to be derived from the mere knowledge of the particular proportions of the raw materials. Had machinery reached that degree of perfection in the time of the ill fated Dudley which it has ſince done, we have good reaſon to believe that the rapid progreſs of the pig iron manufacture would have dated its origin from the æra of that enterpriſing genius. Furnace.

We ſhall conclude this hiſtorical account of the iron manufacture, with a view of the progreſſive quantity produced at the different furnaces in Great Britain at different periods. Produce of furnaces in Britain.

	Tons.
In 1620, the 300 blaſt furnaces mentioned by Dudley, which exiſted in England and Wales, produced each at an average	250
At a later period, but previous to the uſe of pit-coal, 59 furnaces produced each on an average	294
In 1788, 24 charcoal furnaces, which were then going in England, produced each on an average	545
In 1788, 53 blaſt furnaces, in which coak from pit-coal was uſed, yielded each on an average, nearly	907
In 1788, eight furnaces in Scotland produced on an average, each	875
In 1796, there were in England and Wales, 104 furnaces, from each of which was obtained on an average	1048
In 1796, 17 furnaces in Scotland produced each on an average	946

But from the above ſtatement we are not enabled to draw an accurate concluſion of the degree of improvement which has been introduced in blowing machinery; for among the furnaces mentioned in 1796, were included a number of charcoal blaſts, which yielded only a ſmall produce. But the average produce of iron manufactured at pit-coal blaſt furnaces, at no leſs an amount than

	Tons.
At melting furnaces	1200
At forge pig works	2000

To what we have now ſaid, we ſhall only give a view of the prices of the produce of this manufacture, and the channels of conſumption for this immenſe quantity of materials. Prices at different periods.

	Per Ton.
Charcoal pig iron ſold in 1620 for	L.6 0 0
Ditto for melting in 1788	8 0 0
Ditto in 1798	9 10 0
Coak pig iron in the time of Dudley	4 0 0
Ditto in 1788,	5 10 0
Ditto in 1798,	7 10 0
Melting iron in 1802,	8 10 0

The produce of pig iron in England and Wales, and in Scotland, from 168 furnaces, has been calculated at the immenſe quantity of 172,000 tons. It will be impoſſible to ſay with abſolute preciſion what are the channels into which this immenſe quantity of raw materials paſſes for conſumption; but the following views will enable the reader to account for part of it. Conſumption of pig-iron.

	Tons.
Annual conſumption in the erection of new furnaces, forges, &c.	5000

Furnace.

	Tons.
Annual conſumption at forges in Britain, for the manufacture of bar iron - -	70,000
Purchaſed by government in the ſtate of cannons, mortars, &c on an average of three years, including the waſte in melting, &c. with what is employed in the navy as ballaſt - - - - - - -	14,899
Ditto by the India Company - -	5,700
Ditto for merchantmen - - -	11,000
Ballaſt for India and merchantmen -	5,000

Principles of the blaſt furnace.

Let us now conſider the conſtruction and general principles of the blaſt furnace. The term *blaſt* is employed at iron founderies, to ſignify the column of air which is forced into the furnace for the purpoſe of promoting combuſtion. The velocity of this blaſt is produced by the blowing machine impelling the contents of the air-pump through one or two ſmall apertures, and in this way a column of air of various denſity is produced.

Here we propoſe to avail ourſelves of what has been done by Mr Muſhet, formerly of the Calder iron works near Glaſgow, a manufacturer himſelf, who with much philoſophical diſcrimination joins a great deal of excellent practical obſervation. The many valuable hints which he has ſuggeſted, will, we truſt, not only be acceptable, but prove highly beneficial in directing and aſſiſting the views and operations of thoſe concerned in this important manufacture.

To have a clear view of his reaſonings and obſervations on the nature and principles of the blaſt furnace, we ſhall firſt give his deſcription of the building and apparatus, and then detail what he has ſaid concerning its management and mode of operation.

Plate CCXXV. fig. 3 Deſcription of a furnace.

Fig. 3. repreſents a blaſt furnace with part of the blowing machine. A, the regulating cylinder, eight feet diameter and eight feet high. B, the floating piſton, loaded with weights proportionate to the power of the machine. C, the valve, by which the air is paſſed from the pumping cylinder into the regulator: its length 26 inches, and breadth 11 inches. D, the aperture by which the blaſt is forced into the furnace. Diameter of this range of pipes 18 inches. The wider theſe pipes can with conveniency be uſed, the leſs is the friction, and the more powerful are the effects of the blaſt. E, the blowing or pumping cylinder, ſix feet diameter, nine feet high: travel of the piſton in this cylinder from five to ſeven feet per ſtroke. F, the blowing piſton, and a view of one of the valves, of which there are ſometimes two, and ſometimes four, diſtributed over the ſurface of the piſton. The area of each is proportioned to the number of valves: commonly they are 12+46 inches. G, a pile of ſolid ſtone building, on which the regulating cylinder reſts, and to which the ſtanch and tilts of the blowing cylinder are attached. H, the ſafety-valve, or cock; by the ſimple turning of which the blaſt may be admitted to, or ſhut off from the furnace, and paſſed off to a collateral tube on the oppoſite ſide. I, the tuyere, by which the blaſt enters the furnace. The end of the tapered pipe, which approaches the tuyere, receives ſmall pipes of various diameters, from two to three inches, called *noſe pipes*. Theſe are applied at pleaſure, and as the ſtrength and velocity of the blaſt may require. K, the bottom of the hearth, two feet ſquare. L, the top of the hearth two feet ſix inches ſquare. KL, the height of the hearth ſix feet ſix inches. L is alſo the bottom of the boſhes, which here terminate of the ſame ſize as the top of the hearth; only the former are round, and the latter ſquare. M, the top of the boſhes, 12 feet diameter and eight feet of perpendicular height. N, the top of the furnace, at which the materials are charged; commonly three feet diameter. MN, the internal cavity of the furnace from the top of the boſhes upwards, 30 feet high. NK, total height of the internal parts of the furnace, 44½ feet. OO, the lining. This is done in the neceſt manner with fire bricks made on purpoſe, 13 inches long and three inches thick. PP, a vacancy which is left all round the outſide of the firſt lining, three inches broad, and which is beat full of coke-duſt. This ſpace is allowed for any expanſion which might take place in conſequence of the ſwelling of the materials by heat when deſcending to the bottom of the furnace. QQ, the ſecond lining, ſimilar to the firſt. R, a caſt-iron lintel, on which the bottom of the arch is ſupported. RS, the riſe of the arch. ST, height of the arch; on the outſide 14 feet, and 18 feet wide. VV, the extremes of the hearth, ten feet ſquare. This and the boſh-ſtones are always made from a coarſe gritted freeſtone, whoſe fracture preſents large rounded grains of quartz, connected by means of a cement leſs pure.

Furnace.

Fig. 4. repreſents the foundation of the furnace, and a full view of the manner in which the falſe bottom is conſtructed. Fig. 4.

AA, the bottom ſtones of the hearth. B, ſtratum of bedding ſand. CC, paſſages by which the vapours, which may be generated from the damps, are paſſed off. DD, pillars of brick. The letters in the horizontal view, of the ſame figure, correſpond to ſimilar letters in the dotted elevation.

Fig. 5. AA, horizontal ſection of the diameter of the boſhes, the lining and vacancy for ſtuffing at M. C, view of the top of the hearth at L. Fig. 5.

Fig. 6. vertical ſide-ſection of the hearth and boſhes; ſhewing the tymp and dam-ſtones, and the tymp and dam-plates. *a*, the tymp-ſtone. *b*, the tymp-plate, which is wedged firmly to the ſtone, to keep it firm in caſe of ſplitting by the great heat. *c*, dam-ſtone, which occupies the whole breadth of the bottom of the hearth, excepting about ſix inches, which, when the furnace is at work, is filled every caſt with ſtrong ſand. This ſtone is ſurmounted by an iron plate of conſiderable thickneſs, and of a peculiar ſhape *d*, and from this called the dam-plate. The top of the dam-ſtone and plate is two, three, or four inches under the level of the tuyere hole. The ſpace betwixt the bottom of the tymp and the dotted line is alſo rammed full of ſtrong ſand, and ſometimes fire-clay. This is called the tymp-ſtopping, and prevents any part of the blaſt from being unneceſſarily expended. Fig. 6.

The ſquare of the baſe of this blaſt-furnace is 38 feet; the extreme height from the falſe bottom to the top of the crater is 55 feet.

Mode o operatio

Having given the above deſcription of the conſtruction of the furnace, Mr Muſhet next proceeds to take a view of its mode of operation and management. "The operations (he obſerves) I am about to deſcribe have never as yet received any explanation conſonant to true philoſophy or chemical facts; yet there are few which preſent

rnace. preſent a more beautiful chain of affinities, decompoſition, and recombination, than the manufacture of iron in all its various ſtages. An extenſive foundery is a laboratory fraught with phenomena of the moſt intereſting nature in chemiſtry and natural philoſophy: are we not then juſtly ſurpriſed to find that prejudice ſtill reigns there; and that the curious manipulations of theſe regions are ſtill ſhrouded with error and miſconception; as if their dingy ſtructure forbade the entrance of genius, or conſigned her laborious unlettered ſons to an endleſs ſtretch of mental obſcurity?"

Furnace. Charging it.

Having deſcribed the furnace, he continues, "I ſhall proceed to detail the train of preparation neceſſary before the furnace is brought to produce good melting iron.

Putting a prepa- ration.

"The furnace being finiſhed, the bottom and ſides of it, for two feet up the ſquare funnel, receive a lining of common bricks upon edge, to prevent the ſtones from ſhivering or mouldering when the fire comes in contact with it. On the front of the furnace is erected a temporary fire-place, about four feet long, into the bottom of which are laid correſponding bars. The ſide-walls are made ſo high as to reach the under ſurface of the tymp-ſtone; excepting a ſmall ſpace, which afterwards receives an iron plate of an inch and a half thick, by way of a cover: This alſo preſerves the tymp ſtone from any injury it might ſuſtain by being in contact with the flame. A fire is now kindled upon the bars, and is fed occaſionally with ſmall coals. As the whole cavity of the furnace ſerves as a chimney for this fire, the draught in conſequence is violent, and the body of heat carried up is very conſiderable. In the courſe of three weeks the furnace will thus become entirely free from damp, and fit for the reception of the materials: when this is judged proper the fire place is removed, but the interior bricks are allowed to remain till the operation of blowing commences. Some looſe fuel is then thrown upon the bottom of the furnace, and a few baſkets of cokes are introduced; theſe are allowed to become thoroughly ignited before more are added. In this manner the furnace is gradually filled; ſometimes entirely full, and at other times 5-8ths or 3-4ths full. The number of baſkets full depend entirely upon the ſize of the furnace: that in the plate will contain 900 baſkets. If the coal is ſplint, the weight of each baſket-full will be nearly 110lb. × 900 = 99,000lb. cokes. As this quality of cokes is made with a loſs of nearly 50 per cent. the original weight in raw coals will be equal to 198,000lb. When we reflect that this vaſt body of ignited matter is replaced every third day, when the furnace is properly at work, a notion may be formed of the immenſe quantity of materials requiſite, as alſo the conſequent induſtry exerted to ſupply one or more furnaces for the ſpace of one year.

"When the furnace is ſufficiently heated throughout, ſpecific quantities of cokes, iron-ſtone, and blaſt-furnace cinders are added: theſe are called charges. The cokes are commonly filled in baſkets, which, at all the various iron-works are nearly of a ſize. The weight of a baſket, however, depends entirely upon the nature and quality of the coal, being from 70 to 112lb. each (D). The iron-ſtone is filled into boxes, which, when moderately heaped, contain 56lb. of torrefied iron-ſtone; they often exceed this when the ſtone has been ſeverely roaſted. The firſt charges which a furnace receives, contain but a ſmall proportion of iron-ſtone to the weight of cokes: this is afterwards increaſed to a full burden, which is commonly four baſkets cokes, 320lb; two boxes iron-ſtone, 112lb.; one box of blaſt-furnace cinders, 60 or 70lb. (E). At new works, where theſe cinders cannot be obtained, a ſimilar quantity of limeſtone is uſed.

"The deſcent of the charge, or burden, is facilitated by opening the furnace below two or three times a-day, throwing out the cold cinders, and admitting, for an hour at a time, a body of freſh air. This operation is repeated till the approach of the iron-ſtone and cinder, which is always announced by a partial fuſion, and the dropping of lava through the iron bars, introduced to ſupport the incumbent materials while thoſe on the bottom are carried away. The filling above is regularly continued, and when the furnace at the top has acquired a conſiderable degree of heat, it is then judged time to introduce the blaſt; the preparations neceſſary for which are the following:—

Time to apply the blaſt.

"The dam-ſtone is laid in its place firmly imbedded in fire-clay; the dam-plate is again imbedded on this with the ſame cement, and is ſubject to the ſame inclination. On the top of this plate is a ſlight depreſſion, of a curved form, towards that ſide fartheſt diſtant from the blaſt, for the purpoſe of concentrating the ſcoria, and allowing it to flow off in a connected ſtream, as it tends to ſurmount the level of the dam. From this notch to the level of the floor a declivity of brick-work is erected, down which the ſcoria of the furnace flows in large quantities. The opening betwixt the dam and ſide-walls of the furnace, called the *fauld*, is then built up with ſand, the looſe bricks are removed, and the furnace bottom is covered with powdered-lime or charcoal-duſt. The ignited cokes are now allowed to fall down, and are brought forward with iron bars nearly to a level with the dam. The ſpace between the ſurface of the cokes and the bottom of the tymp-plate is next rammed hard with ſtrong binding ſand; and theſe cokes, which are expoſed on the outſide, are covered with coke-duſt. Theſe precautions being taken, the tuyere-hole is then opened and lined with a ſoft mixture of fire-clay and loam: the blaſt is commonly introduced into the furnace at firſt with a ſmall diſcharging-pipe, which is afterwards increaſed as occaſion may require. In two

(D) "This ſame variety in the coal renders it almoſt impoſſible, under one deſcription, to give a juſt idea of the proportions uſed at various blaſt furnaces: to avoid being too diffuſe, I ſhall confine my deſcription connected with a coal of a medium quality, or a mixture of ſplint and free-coal, a baſket of which will weigh from 78lb. to 84lb.

(E) "A preference at firſt is always given to blaſt-furnace cinders in place of lime; being already vitrified, they are of much eaſier fuſion, and tend to preſerve the ſurface of the hearth by glazing it over with a black vitrid cruſt.

Furnace. hours after blowing, a conſiderable quantity of lava will be accumulated; iron bars are then introduced, and perforations made in the compreſſed matter at the bottom of the furnace; the lava is admitted to all parts of the hearth, and ſoon thoroughly heats and glazes the ſurfaces of the fire-ſtone. Shortly after this it riſes to a level with the notch in the dam-plate, and by its own accumulation, together with the forcible action of the blaſt, it flows over. Its colour is at firſt black; its fracture denſe and very ponderous; the form it aſſumes in running off is flat and branched, ſometimes in long ſtreams, and at other times leſs extenſive. If the preparation has been well conducted, the colour of the cinder will ſoon change to white; and the metal, which in the ſtate of an oxyde formerly coloured it, will be left in a diſengaged ſtate in the furnace. When the metal has riſen nearly to a level with the dam, it is then let out by cutting away the hardened loam of the fauld, and conveyed by a channel, made in ſand, to its proper deſtination; the principal channel, or runner, is called the *ſow*, the lateral moulds are called the *pigs*.

Fuſed metal let out.

"In ſix days after the commencement of blowing, the furnace ought to have *wrought herſelf clear*, and have acquired capacity ſufficient to contain from 5000 to 7000 weight of iron. The quality ought alſo to be richly carbonated, ſo as to be of value and eſtimation in the pig-market. At this period, with a quality of coal as formerly mentioned, the charge will have increaſed to the following proportions:—Five baſkets cokes, 400lb.; ſix boxes iron-ſtone, 336lb.; one box limeſtone, 100lb.

"An analyſis of the ſmelting operation, and the tendency which the individual agents have to produce change in the quality and quantity of the iron, come next under conſideration. Let us, however, firſt notice the characteriſtic features exhibited by the different kinds of iron while in fuſion, whereby the quality of the metal may be juſtly defined.

Characters of the produce.

"When fine (N° 1.) or ſuper-carbonated crude iron is run from the furnace, the ſtream of metal, as it iſſues from the fauld, throws off an infinite number of brilliant ſparkles of carbone. The ſurface is covered with a fluid pellicle of carburet of iron, which, as it flows, rears itſelf up in the moſt delicate folds: at firſt the fluid metal appears like a denſe, ponderous ſtream, but, as the collateral moulds become filled, it exhibits a general rapid motion from the ſurface of the pigs to the centre of many points; millions of the fineſt undulations move upon each mould, diſplaying the greateſt nicety and rapidity of movement, conjoined with an uncommonly beautiful variegation of colour, which language is inadequate juſtly to deſcribe. Such metal, in quantity, will remain fluid for 20 minutes after it is run from the furnace, and when cold will have its ſurface covered with the beautiful carburet of iron, already mentioned, of an uncommonly rich and brilliant appearance. When the ſurface of the metal is not carbureted, it is ſmooth like forged iron, and always convex. In this ſtate iron is too rich for melting without the addition of coarſe metal, and is unfit to be uſed in a cupola furnace for making fine caſtings, where thinneſs and a good ſkin are requiſite.

"N° 4. or oxygenated crude iron, when iſſuing from the blaſt-furnace, throws off from all parts of the fluid ſurface a vaſt number of metallic ſparks: they ariſe from a different cauſe than that exerted in the former inſtance. The extreme privation of carbone renders the metal ſubject to the combination of oxygen ſo ſoon as it comes into contact with atmoſpheric air. This truth is evidently manifeſted by the ejection of ſmall ſpherules of iron from all parts of the ſurface; the deflagration does not, however, take place till the globule has been thrown two or three feet up in the air; it then inflames and ſeparates with a ſlight hiſſing exploſion, into a great many minute particles of a brilliant fire. When theſe are collected they prove to be a true oxyde of iron, but ſo much ſaturated with oxygen, as to poſſeſs no magnetic obedience. The ſurface of oxygenated iron, when running, is covered with waving flakes of an obſcure ſmoky flame, accompanied with a hiſſing noiſe; forming a wonderful contraſt with the fine rich covering of plumbago in the other ſtate of the metal, occaſionally parting and exhibiting the iron in a ſtate of the greateſt apparent purity, agitated in numberleſs minute fibres, from the abundance of the carbone united with the metal. Furnace.

"When iron thus highly oxygenated comes to reſt, ſmall ſpecks of oxyde begin to appear floating upon the ſurface: theſe increaſe in ſize; and when the metal has become ſolid, the upper ſurface is found entirely covered with a ſcale of blue oxyde of various thickneſſes, dependent upon the ſtage of oxygenation or extreme privation of carbone. This oxyde, in common, contains about 15 per cent. of oxygen, and is very obedient to the magnet. In place of a dark blue ſmooth ſurface, convex and richly carbonated, the metal will exhibit a deep, rough, concave face, which, when the oxyde is removed, preſents a great number of deep pits. This iron in fuſion ſtands leſs convex than carbonated iron, merely becauſe it is leſs ſuſceptible of a ſtate of extreme diviſion; and indeed it ſeems a principle in all metallic fluids, that they are convex in proportion to the quantity of carbone with which they are ſaturated. This iron flows dead and ponderous, and rarely parts in ſhades but at the diſtance of ſome inches from each other.

"This is a ſlight ſketch of the appearance of the two extreme qualities of crude or pig iron, when in a ſtate of fuſion. According to the diviſion formerly made, there ſtill remain two intermediate ſtages of quality to be deſcribed: theſe are, carbonated and carbo-oxygenated iron; that is N° 2. and 3. of the manufacturers. Carbonated iron exhibits, like N° 1, a beautiful appearance in the runner and pig. The breakings of the fluid, in general, are leſs fine; the agitation leſs delicate; though the diviſion of the fluid is equal, if not beyond that of the other. When the internal ebullition of the metal is greateſt, the undulating ſhades are ſmalleſt and moſt numerous: ſometimes they aſſume the ſhape of ſmall ſegments; ſometimes fibrated groups; and at other times minute circles, of a mellower colour. that the ground of the fluid. The ſurface of the metal, expoſed to the external air, when cooling is generally ſlightly convex, and full of punctures: theſe, in iron of a weak and fuſible nature, are commonly ſmall in the diameter, and of no great depth. In ſtrong metal the punctures are much wider and deeper. This criterion, however, is not infallible, when pig-iron of different works, is taken collectively. At each individual work, however, that iron will be ſtrongeſt whoſe honeycombs are largeſt and deepeſt.

"Carbo-

Furnace. "Carbo-oxygenated, or N° 3. pig-iron, runs ſmoothly, without any great degree of ebullition or diſengagement of metallic ſparks. The partings upon its ſurface are longer, and at greater diſtances from each other than in the former varieties; the ſhape they aſſume is either elliptical, circular, or curved. In cooling, this metal acquires a conſiderable portion of oxyde; the ſurface is neither markedly convex nor concave; the punctures are leſs, and frequently vaniſh altogether. Their abſence, however, is no token of a ſmooth face ſucceeding: in qualities of crude iron oxygenated beyond this, I have already mentioned that a concave ſurface is the conſequence of the extreme abſence of carbone; and that, in proportion as this principle is abſent, the ſurface of the iron acquires roughneſs and aſperity.

"It may perhaps be proper here to mention, once for all, that although, for convenience, the manufacturer has, from a juſt eſtimation of the value of the metal in a ſubſequent manufacture, affixed certain numbers for determinate qualities of iron, yet it is difficult to ſay at what degree of ſaturation of carbone each reſpective term commences: ſuffice it then to ſay, that the two alternative principles, oxygen and carbone, form two diſtinct claſſes, that in which oxygen predominates, and that in which carbone predominates; the latter comprehends N° 1. and 2. of the manufacturers, the former includes oxygenated, white and mottled; and the equalization of theſe mixtures form, as has already been noticed, the variety of carbo-oxygenated crude iron.

"I ſhall now obſerve ſome things relative to the various faces which crude iron aſſumes. N° 1. and 2. with their intermediate qualities, poſſeſs ſurfaces more or leſs convex, and frequently with thin bliſters: this we attribute to the preſence of carbone, which being plentifully interſperſed betwixt and throughout the particles of the metal, the tendency which the iron has to ſhrink in cooling is entirely done away; it tends to diſtend the aggregate of the maſs, and to give a round face, by gradually elevating the central parts of the ſurface, which are always laſt to loſe their fluidity.

"Again, that quality of iron known by the name of N° 3. or carbo-oxygenated, is moſt commonly found with a flat ſurface. If we ſtill farther trace the appearance of the ſurface of pig-iron, when run from the furnace, we ſhall find N° 4. either with a white or mottled fracture, poſſeſſed of concave faces rough and deeply pitted. Beyond this it may be imagined that every degree of further oxygenation would be productive of a ſurface deeper in the curve, and rougher, with additional aſperities. The contrary is the caſe: when crude iron is ſo far debaſed as to be run from the furnace in clotted lumps highly oxygenated, the ſurface of the pigs is found to be more convex than that of N° 1. iron; but then the fracture of ſuch metal preſents an impure maſs covered on both faces with a mixture of oxydated iron, of a blueiſh colour, nearly metallic. In ſhort, this quality of iron is incapable of receiving ſuch a degree of fluidity as to enable us to judge whether the convexity of its ſurface is peculiar to its ſtate, or is owing to its want of diviſion as a fluid, whereby the gradual conſolidation of the metal is prevented.

"Theſe features ſufficiently diſtinguiſh betwixt the various qualities of crude iron after they are obtained from the blaſt furnace: there are, however, criterions not leſs infallible, whereby we can prejudge the quality of the metal many hours before it is run from the furnace. Theſe are the colour and form of the ſcoria, the colour of the vitrid cruſt upon the working bars, and the quantity of carburet which is attached to it. The variety of colour and form in the cinder almoſt univerſally indicate the quality of the metal on the hearth. Hence, from a long courſe of experience, have ariſen the following denominations: "Cinder of ſulphury iron;" "Cinder of N° 1. N° 2. and N° 3.;" and "Cinder of ballaſt iron." Although at different works, from local circumſtances, the ſame kind of ſcoria may not indicate preciſely the ſame quality of iron, yet the difference is ſo ſmall that the following deſcription of the various cinders may convey a very juſt idea of their general appearance. Furnace. Determined from the colour and form of the ſcoria.

"When the ſcoria is of a whitiſh colour and ſhort form, branching from the notch of the dam, and emitting from its ſtream beautiful ſparks of ignited carbone, reſembling thoſe ejected from a crucible of caſt ſteel in fuſion, expoſed to external air, or to the combuſtion of fine ſteel filings in a white flame; if, when iſſuing from the orifice of the furnace, it is of the pureſt white colour, poſſeſſing no tenacity, but in a ſtate of the greateſt fluid diviſion, and, when cold, reſembles a maſs of heavy torrefied ſpar, void of the ſmalleſt vitrid appearance, hard and durable, it is then certain that the furnace contains *ſulphury iron*, i. e. ſuper-carbonated iron. At blaſt furnaces, where a great quantity of air is thrown in per minute, ſuper-carbonated crude iron will be obtained with a cinder of a longer form, with a rough flinty fracture towards the outſide of the column.

"That cinder which indicates the preſence of carbonated iron in the hearth of the furnace, forms itſelf into circular compact ſtreams, which become conſolidated and inſerted into each other; theſe are in length from three to nine feet. Their colour when the iron approaches the firſt quality, is a beautiful variegation of white and blue enamel, forming a wild profuſion of the elements of every known figure; the blues are lighter or darker according to the quantity of the metal and the action of the external air while cooling. When the quality of the pig-iron is ſparingly carbonated, the blue colour is leſs vivid, leſs delicate; and the external ſurface rougher, and more ſullied with a mixture of colour. The ſame ſcoria, when fuſed in veſſels which are allowed to cool gradually, parts with all its variety and ſhade, and becomes of a yellowiſh colour, ſometimes nearly white when the quantity of incorporated metals has been ſmall.

"The cinder which is emitted from the blaſt furnace when carbo-oxygenated (or N° 3.) iron is produced, aſſumes a long zig-zag form. The ſtream is ſlightly convex in the middle; broad, flat, and obliquely furrowed towards the edges. The end of the ſtream frequently rears itſelf into narrow tapered cones, to the height of ſix or eight inches: theſe are generally hollow in the centre, and are eaſily demoliſhed, owing to their exceſſive brittleneſs. The colour of this lava is very various; for the moſt it is pale yellow, mixed with green. Its tenacity is ſo great, that if, while fluid, a ſmall iron hook is inſerted into it at a certain degree of heat, and then drawn from it with a quick but ſteady motion, 20 to 30 yards of fine glaſs thread may be formed with eaſe. If the colours are vivid and variegated, the thread will poſſeſs, upon a minute ſcale, all

Furnace. the various tints of colouring which is found in the columnar mass. When by accident a quantity of this lava runs back upon the discharging-pipe, it is upon the return of the blast impelled with such velocity as to be blown into minute delicate fibres, smaller than the most ductile wire; at first they float upon the air like wool, and when at rest very much resemble that substance.

"The presence of oxygenated crude iron (N° 4.) on the furnace hearth, is indicated by the lava resolving itself into long streams, sometimes branched, sometimes columnar, extending from the notch to the lowest part of the declivity; here it commonly forms large, flat, hollow cakes, or inclines to form conical figures: these are, however, seldom perfect; for the quantity of fluid lava, conveyed through the centre of the column, accumulates faster than the internal sides of the cone are consolidated; and thus, when the structure is only half finished, the small crater vomits forth its superabundant lava, and is demolished. The current of such lava falls heavily from the dam as if surcharged with metal, and emits dark red sparks resembling the agitation of straw embers. Its colour is still more varied than the former descriptions of scoriæ, and is found changing its hues through a great variety of greens shaded with browns. Another variety of scoria, which indicates the same quality of iron, assumes a similar form; but has a black ground colour mixed with browns, or is entirely black. When the latter colour prevails, the texture of the cinder becomes porous; the quantity of iron left is now very considerable, and such as will be easily extracted in the assay-furnace with proper fluxes. In cases of total derangement in the furnace, the scoria will still retain this black colour, although the quantity of metal may amount to 25 per cent.; the fracture, however, becomes dense, and its specific gravity increases in proportion to the quantity of metal it holds incorporated.

"The next source of information, as to the quality of the iron in the furnace, is to be got from the colour of the scoria upon the working bars, which are from time to time inserted to keep the furnace free from lumps, and to bring forward the scoria. When supercarbonated crude iron is in the hearth, the vitrid crust upon the bars will be of a black colour and smooth surface, fully covered with large and brilliant plates of plumbago.

"As the quality of the metal approaches to N° 2. (carbonated), the carburet upon the scoria decreases both in point of quantity and size.

"When carbo-oxygenated iron (N° 3.) is in the furnace, the working bars are always coated with a lighter coloured scoria than when the former varieties exist; a speck of plumbago is now only found here and there, and that of the smallest size. When the quality of the metal is oxygenated (N° 4.), not only have the plates of carburet disappeared, but also the coally colour on the external surface of the scoria; what now attaches to the bars, is nearly of the same nature and colour as the lava emitted at the notch of the dam.

"These criterions are infallible; for, as the fusibility or carbonation of the metal is promoted in a direct ratio to the comparative quantity of the coally principle in the furnace, so in the same proportion will the vitrid crust encircling the working bars exhibit the presence of that principle in the furnace.

"In the smelting operation a just proportion and association of materials and mechanical construction ought to be blended in order to produce the best possible effects. Under the former are comprehended the cokes, iron-stone, limestone, and blast; by the latter is understood the furnace, the power of the blowing-machine, or the compression and velocity under which the air is discharged into the furnace, and the genius or mechanical skill of the workmen. According to this division I shall endeavour to point out the very various effects which disproportion in any case produces, and *vice versa*. Furnace.

"In the preceding observations the coal and iron stone have been traced through their various stages of preparation, and that stage pointed out in which they were most suitable for the profitable manufacture of the metal. It will be necessary to carry along with us this fact, that in the exact proportion which the quantity of carbone bears to the quantity of metal in the ore, and its mixtures, so will be the fusibility, and of course the value of the pig-iron obtained. The importance of this truth will still farther appear when we consider the very various qualities of pit-coal, the different proportions of carbone which they contain, and the various properties attached to every species of this useful combustible.

Nature of coal examined. "Among the many strata of coal which I have distilled, some I have found to contain 70 parts in the 100. This large proportion is peculiar to the clod-coal, used at some of the iron-works in England, and justly preferred for the purpose of manufacture, to the purest and hardest variety of splint-coal. The latter I have found to average from 50 to 59 parts of carbone in the 100; and the soft, or mixed qualities of coal, from 45 to 53 parts. Such various proportions of carbone plainly point out that the operations to be followed at each individual iron-work ought not to rest upon precedent, unless borrowed from those works where exactly the same quality of coal is used. This analysis also lays open part of the source from whence originates the widely different quantities of metal produced per week at various blast-furnaces, and the great disproportions of ore used to different coals.

"Experience has shewn that the three qualities of coal just mentioned, will smelt and give carbonation to the following proportions of the same species of torrefied iron stone:

112 lb. of clod-coal cokes will smelt - 130 lb.
112 lb. of splint-coal cokes will smelt - 105 lb.
112 lb. mixed soft and hard coal cokes will smelt 84 lb.

"Let the iron stone be supposed in the blast furnace to yield 40 per cent. then we find that the one-twentieth of a ton of the respective qualities of cokes will smelt and carbonate the following proportions of iron, viz. 112 lb. clod-coal cokes, 130 lb. iron stone, at 40 per cent. = 52 lb. iron; 112 lb. of splint-coal cokes, 105 lb. of the stone = 42 lb. of iron; and 112 lb. soft and hard coal cokes, 84 lb. of the iron stone = $33\frac{6}{10}$ lb. of iron. We then have for the quantity of metal produced by one ton of each quality of cokes:

Clod-coal 52 × 20 = 1040 lb.
Splint ditto 42 × 20 = 840 lb.
Mixed ditto $33\frac{6}{10}$ × 20 = 702 lb.

"This furnishes a datum whereby we easily obtain the

Furnace. the quantity of the various cokes neceſſary to produce one ton of carbonated crude iron by common proportion: for if 10401b of metal are produced by one ton, or 22401b. of clod-coal cokes, the quantity of the ſame cokes requiſite for the production of one ton, or 22401b. of metal will be— Furnace.

		T.	C.	Q. lb.
	4824.61b.=2	3	0	8
Splint-coal cokes	840:2240::2240:5973.31b.=2	13	1	9
Mixed ditto	702:2240::2240:7147.51b.=3	3	3	7

" If to the quantity of cokes neceſſary to manufacture one ton of crude iron, we add the quantity of volatile matter driven off in the proceſs of charring, which may be thus eſtimated upon the average of each quality:

Clod-coal	$\frac{3}{8}$ or 37½ per c.	produce in cokes $\frac{5}{8}$	*a* 62½ per c.
Splint coal	$\frac{4}{8}$—50	$\frac{4}{8}$ or	50
Mixed coal	$\frac{5}{8}$—62,5	$\frac{3}{8}$—	37½

" Then, for the quantity of the reſpective coals uſed in the raw ſtate, we have the following reſults in proportion:

			T.	C.	Q. lb.
Clod-coal	5 : 4824.6 :: 8 :	$7719\frac{3}{4}$ =	3	8	2 19
Splint coal	4 : 5973.3 :: 8 :	11946 =	5	6	2 18
Mixed coal	3 : 7147.1 :: 8 :	$16158\frac{2}{3}$ =	8	11	0 16

Difference of produce from different kinds of coal.

" Theſe great diſproportions of quantity, uſed to fabricate one ton, or 2240 averdupoiſe pounds of the ſame quality of crude iron, will convey a ſtriking and impreſſive idea of the multifarious qualities of coal which may be applied and made to produce the ſame effects. It ſhould alſo convince the manufacturer that the ſtudy and analyſis of his own materials is the firſt and radical approach to true knowledge, and certainty of operation. Diveſt him of this knowledge, and view him guided by the cuſtoms and rules prevalent at another manufactory, where the coals and ores may be as different as has been already mentioned, and we will no longer wonder at the uncertainty of his reſults, and the numberleſs errors of his direction.

" Before I enter into the practical diſcuſſion of the application of coal, I beg leave to indulge myſelf in the following calculations:—We have already ſeen that the production of 22401b. of carbonated crude iron requires 4824lb. of clod-coal cokes; theſe may be averaged to contain 4.5 per cent. of aſhes, which, deducted from 4824, gives 4607lb. of carbone uſed for one ton of metal: this ſum, divided by 2240, farther gives, for one lb. of caſt iron thus manufactured, 2.056 lb. of carbone.

" We next find that 22401b. of the ſame metal requires of ſplint coal cokes 5973.31b.; we farther find, from a table of the analyſis of coal, furniſhed in a former paper, that 100 parts of the raw coal contained 4.2 parts of aſhes. As it is there ſtated to loſe 50 per cent. in charring, 100 parts of cokes will contain 8.4 of aſhes; and 8.4 per cent. deducted from 5973.3, gives 5472lb. of carbone. This again, reduced by 22401b. gives for each pound of metal manufactured, 2.4421b.

" Again, 7147.11b. of cokes obtained from ſoft mixed coals are conſumed for every ton of 2240 averdupoiſe pounds of crude iron produced; every 100 parts of the ſame coals contain 3.3 parts of aſhes; and 100 parts of cokes contain nearly 6.5 per cent. of aſhes, which, deducted from 7147.3, gives 6672.6 of carbone, which divided by 2240, gives, for the quantity uſed for one pound of caſt iron, 2.978 lb.

" From theſe calculations it appears, that 22401b. of carbonated iron, requires of carbone from clod-coal 4607lb.; of carbone from ſplint-coal, 5472lb.; and of carbone from mixed coal, 6672lb.: that one pound of carbonated iron requires of carbone from clod-coal cokes 2.056lb.; from ſplint, 2.4421b.; from mixed, 2.9831b.; and that carbonated crude iron may be obtained when widely different quantities of carbone have been conſumed.

" In ſeeking for a ſolution of the latter fact, we muſt have recourſe to the different degrees of inflammability of the carbone, according to the various laws of continuity impoſed upon it in its foſſil conſtruction. It can eaſily be conceived, that, owing to this ſtructure, and the nature of the interpoſed aſhes, the particles of carbone of ſome cokes will be more eaſily oxygenated that thoſe of others; in the ſame way that we find ſplint-coal, when expoſed to ignition in contact with open air, affords one-third of more cokes than are obtained from ſoft mixed coals, though the latter, when diſtilled, yield more pure carbone than the former.

" By experiment it is proven that 100 grains of carbonic acid gas is compoſed of 72 parts of oxygen, united with 28 parts of carbone: if the quantity of the carbone of clod-coal, viz. 2.056lb. uſed for the manufacturing of every pound of caſt iron, is reduced to grains, we will find it to conſiſt of 14392 grains; this, divided by 28, gives the acidifiable principle of 514 × 100=51400 grains of carbonic acid gas (F): hence as one cubic foot of this gas, at 29.84 of barometrical preſſure, and 54.5 of temperature, weighs nearly 761 grains, we find that in the formation of every pound of caſt iron $\frac{51400}{761}$ = 67,54 cubical feet of carbonic acid gas will be formed; and in the production of one ton of metal, the aſtoniſhing quantity of 151289,60 cubic feet. This quantity, however incredible it may ſeem, is only what would be formed under the above preſſure, and at the above temperature: when we take into the account the high temperature at which the decompoſition and recombination are effected, with the conſequent

(F) " This is ſuppoſing, for the moment, that the whole of the carbone is oxygenated, either by the oxygen contained in the ore, or obtained from the diſcharging-pipe by the decompoſition of the atmoſpheric air: this, however, is not ſtrictly true, as the metal takes up a ſmall portion, by weight, of the carbone; and when, by accident, moiſture has been introduced into the furnace, either through the medium of the blaſt, or of the materials, its decompoſition furniſhes a portion of both oxygen and hydrogen, which may diſſolve, and alſo carry off, a part of the carbone. Atmoſpheric air being found to hold water in ſolution, a ſmall quantity of hydrogen will, even in the drieſt weather, be preſent in the blaſt-furnace.

Furnace. quent increaſe of elaſtic force and of volume, our ideas are almoſt unable to commenſurate the ſum of the gas hourly formed, and thrown off, ignited to the higheſt degree of heat.

" If the ſame mode of calculation is adopted with the other qualities of coal, we will have the following reſults:

" For the ſplint-coal 2,442 lb. or $\frac{17094}{28} = 610,5 \times 100 = 61050$ grains of carbonic acid, which gives $\frac{61050}{761} = 82,85$ cubic feet for 1 lb. and $82,85 \times 2240 = 185,584$ cubic feet for one ton. For the mixed coal 2,983 or $\frac{20881}{28} = 710 \times 100 = 71000$ grains carbonic acid; that is, $\frac{71000}{761} = 93,3$ cubical feet for 1 lb.; and $93,3 \times 2240 = 208,992$ cubical feet for one ton. By the ſame calculation we may attain a pretty accurate notion of the quantity of atmoſpheric air neceſſary to produce 1 lb. or one ton of caſt iron; an average of the three varieties of coal will be ſufficiently accurate for this purpoſe; thus $\frac{14392 \times 17094 \times 20881}{3} = 17455\frac{2}{7}$ or 2,4935 lb. of carbone are conſumed upon the average of each pound of pig-iron: this is found to produce of carbonic acid gas $\frac{17455\frac{2}{7}}{28} = 62.341 \times 100 = 62.30041$ grains; which again divided by 761, the grains in one cubic foot, gives 81.86 cubic feet for the gas diſcharged in manufacturing one pound of caſt iron. As carbonic acid contains, as has already been noticed, 72 parts of oxygen in 100, then we have for the quantity of oxygen gas 100 : 72 :: 62400.41 : 44856.29 grains oxygen gas; and as, at the ordinary temperature and preſſure of the atmoſphere, a cubic foot of oxygen gas weighs 591 grains, we find 44856.29 divided by 591 = 75.89 cubic feet of oxygen gas neceſſary to form the acidifying principle of 81.86 cubic feet of carbonic acid gas; and that the ſame quantity of oxygen gas is neceſſary to the production of one pound of carbonated crude iron. This leads us to the following ſtatement for the quantity of atmoſpheric air uſed during the ſame operation; firſt premiſing that the conſtituent parts of atmoſpheric air are nearly 73 of azote and 27 of oxygen gas; of atmoſpheric air then neceſſary, we have 27 : 100 :: 75.89 : 281 cubic feet.

" I ſhall now proceed from mere calculation to matter of fact, and attempt to prove the correctneſs of the former by the approximation of the latter to its reſults. Let a blaſt-furnace be ſuppoſed to produce $20\frac{1}{4}$ tons of pig-iron per week, = 45360 avoirdupoiſe pounds; this divided by days, hours, minutes, and ſeconds, gives per day 6480 pounds, per hour 270, per minute $3\frac{3}{4}$ lb. and per ſecond 525 grains.

" From this it is evident that one pound of caſt iron is produced in $13\frac{33}{100}$ ſeconds; experience has ſhewn that a blaſt-furnace, producing, in any of the above periods, the reſpective quantity of metal, requires a diſcharge of air per minute nearly equal to 1350 cubic feet; this, divided by 4,5 lb. the quantity produced per minute gives, for one pound of iron, 300 cubic feet. The quantity, by calculation, we have ſeen to be 281 cubic feet, difference 19; a ſum no way conſiderable when we reflect upon the inequality of the movements of a blowing machine, and when it is recollected that ſome allowance ought alſo to be made for what air may paſs through the furnace undecompoſed, or may be loſt at the place of entrance. Furnace.

" From this coincidence of theory with practice, we cannot help admiring the rigorous principles on which the Lavoiſierian ſyſtem is founded; nor are we leſs pleaſed to find, that, ſmall as the operations of the chemiſt may be, yet they are a juſt epitome of what takes place in the philoſophy of extenſive manufactories. The following table exhibits the quantity of carbone which may be uſed upon an average, with the relative quantity of carbonic acid formed, and air uſed:

" In the manufacture of 1. lb.—1 ton of iron,

The pure carbone requiſite is	2.49—	5585.44 lb.
Carbonic acid formed	81.86—	183366.40 cub. ft.
Oxygen gas uſed	75.89—	169993.60 cub. ft.
Atmoſpheric air employed	281.00—	629440.00 cub. ft.

" From the foregoing particulars upon coal may be learned how much is dependent upon the native conſtruction of coal and its conſtituent parts; I ſhall next advert to the effects produced by its improper preparation.

" When coals intended for the blaſt-furnace are ſufficiently charred, they ought, in point of colour, to be of a ſilver-gray; their fracture will appear lamellated and porous if ſplint-coals have been uſed; ſofter coals form themſelves into branches ſlightly curved, and, when properly prepared, are always very porous. I have frequently found that the better the cokes were charred, the more water they will abſorb. Coals half burnt do not take up half ſo much water, becauſe their fracture continues in part to be ſmooth and leſs porous than when thoroughly burnt. Qualities of well-charred coal.

" When half-prepared cokes are introduced into the furnace, the metal formerly carbonated will loſe its gray fracture, and approach to the quality of oxygenated iron. Their preſence is eaſily detected by the unuſual quantity of thick vapour ariſing along with the flame. Beſides, the water and ſulphur, which raw coals introduce into the furnace, and which always impair the quantity of carbone by the various ſolutions effected by the preſence of oxygen, hydrogen, &c. the fitneſs of the coal for combuſtion, and the ſupport of the ore, is much diminiſhed by this ſecond courſe of ignition and diſengagement of bitumen. The preſſure of the incumbent ores alſo fracture and reduce the cokes into ſmall pieces, which produce a conſiderable portion of coke-duſt; this is partly carried to the top of the furnace before the blaſt; ſometimes below it appears in immenſe quantities, ignited to whiteneſs, and liquid as ſand. Coal thus detached from the maſs, expoſed to the action of a compreſſed current of air, is unfit for conveying the carbonic principle to the metal; and as it frequently belongs to the juſt proportion of charcoal neceſſary to ſmelt the ores, and to carbonate their iron, its loſs muſt be felt, and the quality of iron impaired.

" When cokes of any quality are expoſed to a moiſt atmoſphere, ſo as to abſorb water, their effects in the blaſt furnace become much reduced, and the preſence of the water is productive of the moſt hurtful conſequences in the production of carbonated crude iron. I have found, by repeated experiment, that one pound of Effects of cokes greatly diminished by abſorbing water.

well-

Furnace.

well prepared cokes will, when laid in water, take up $1\frac{1}{4}$ ounce in the ſpace of half an hour; at this rate, a baſket of cokes weighing 80 lb. ſaturated with water, will contain 140 ounces of water, or $8\frac{3}{4}$ lb. If the charge contains ſix baſkets, then we ſee that upwards of 50 lb. of water is introduced regularly along with the charge, furniſhing an additional quantity of oxygen equal to $42\frac{1}{4}$ lb. and of hydrogen equal to $7\frac{1}{2}$ lb.; but it frequently happens that the cokes contain a larger portion of water than is here ſtated. When cokes thus ſurcharged are introduced in quantity into the blaſt furnace, the quality of the metal is not always inſtantaneouſly changed, and frequently the colour and form of the cinder remain long without any great alteration. The contact of wetted cokes with the ore is firſt ſeen by the great diſcharge of pale blue gas, with the whiter flame at the top of the furnace; next, the accumulating oxyde upon the ſurface of the pig when conſolidating indicates their preſence. Iron thus oxygenated frequently exhibits, while fluid, that agitation and delicate partings peculiar to carbonated metal: the remelting of this iron is never attended with advantage, and is always unprofitable to the founder.

"From the properties which have been aſſigned to pit-coal, the following facts may be deduced:—That charcoal is the baſis of the manufacture of crude iron; that its proper application produces the moſt valuable qualities of pig-iron; that, by diminiſhing its relative proportion, or contaminating its quality by heterogeneous mixtures, the value and fuſibility of the metal is loſt; but that, by a proper increaſe, and always in proportion to this increaſe, will the fuſibility and value of the iron be mended. From the whole, an important leſſon may be learned of the pernicious effects of water in the furnace, and how abſolutely neceſſary it is to prepare the cokes without uſing water, either to damp the fires, as in the uſual mode, or to cool the cinders obtained from the tar kilns, to prevent their conſuming in the open air: in all this hurtful operation conſiderable quantities of water become fixed in the cokes, which require a very great degree of heat to expel.

"The preparation of iron ſtone has already been fully attended to, and the phenomena which it exhibits under every ſtage minutely deſcribed. In conſequence of various experiments we are authoriſed to draw the following concluſions: That when pure calcareous iron-ſtone is uſed, it admits of having the local quantities of cokes diminiſhed; that argillaceous requires a larger portion than the calcareous genus; and that ſiliceous iron-ſtone requires a greater proportion of fuel than any variety of the former genera. We have alſo ſeen that fuſibility, either connected with ſtrength or otherwiſe, is derived from the mixture of the ores; and that exceſſive brittleneſs, intimately connected with infuſibility, is alſo derived from the ſame ſource. From a review of theſe facts, we are forcibly impreſſed with the importance of combining the prepared iron-ſtones with proportions of fuel ſuited to their various natures, in order to produce all the varieties of iron with the greateſt poſſible economy. Contemplating farther the ſame ſubject, it is eaſy to be conceived that a want of knowledge of the component parts of iron-ſtones, and the effects which individually they produce, muſt lead to great uncertainty of operation in the ſmelting proceſs, wherein the beautiful economy of nature, and even real property, will be often unprofitably ſacrificed to precedent.

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"Beſides the above cauſes of alteration, dependent upon mixtures of the earths, the exiſtence of oxygen in various quantities in the ores ought never to be overlooked in proportioning the cokes to the iron-ſtone. This powerful agent, whoſe form and ſubſtance conſtantly eludes our viſion; whoſe exiſtence is only aſcertained by the wonderful changes produced by its various combinations with the iron; and whoſe preſence in the ſame iron-ſtone, in various quantities, may produce ſuch variety of reſult as to characteriſe the ores, as containing *good* or *bad* iron, ſurely forms the moſt intereſting mixture which ores or iron-ſtones poſſeſs. It will be a momentous epoch in the manufacture of iron when the exiſtence of ſuch a principle ſhall be fully admitted by the manufacturer, and its agency, from certain viſible effects produced, adopted to explain its accompanying phenomena. Till that period he will not perceive the utility of aſcertaining the quantity of oxygen, and deviſing economical methods of taking it from the ore. An attention to this powerful principle can alone root out thoſe prejudices ſo inimical to the real intereſts of the manufacturer, and which ſeem to glance at nature, as having improvidently combined her moſt uſeful metal with mixtures which could reſiſt the ingenuity of man, or ſet his comprehenſive intellect at defiance. In the progreſs of this great inquiry, is it not poſſible that the preſent expenſive exertions may in part be ſuperſeded. Is it not poſſible, that, by laying open the ſources of information to individuals at large, a greater maſs of intellect may engage in the practice of this art? While the preſent extenſive and lofty buildings are neceſſary, the buſineſs is entirely confined in the hands of men of great capital: the extent of their manufactures require that a large tract of country be devoted to their ſupply; a natural conſequence is, that innumerable tracts of land are overlooked, or held unworthy of notice, merely becauſe they cannot, in a period neceſſary to clear a great capital and inſure a fortune, afford the neceſſary ſupply of materials. Such ſituations, according to the preſent ſtate of the iron buſineſs, muſt remain unexplored. Should, however, a deſire for truth once gain footing in the manufactories of iron, and ſhould this natural impulſe of the unprejudiced mind keep pace with other branches of intellectual information, we may not deſpair of ſeeing many imperfections removed, which were the unavoidable conſequence of the period of their creation.

The oxygen of the iron-ſtone

"In the application of iron-ſtone in the blaſt furnace, the following particulars ought rigorouſly to be attended to:—

"1. Their mixture, whether clay, lime, or ſilex; their relative proportions to each other, judging according to the rules formerly laid down; which of them may admit of a diminution of fuel; which of them will afford the quality of iron at the time requiſite; and which of them will be moſt likely, by a judicious arrangement, to give the greateſt produce of metal, united with value and economy. Iron ſtones, united with large portions of ſilex, have already been ſtated to require a greater proportion of fuel to carbonate their metal than the other genera. When ballaſt or forge-pigs are wanted, it

and its other qualities to be conſidered.

Furnace. is obvious that ſiliceous iron-ſtones ought to be uſed; not that they contain a greater quantity of iron, but becauſe they form a ſubſtitute for the other kinds, which may be more advantageouſly ſmelted for the production of more valuable qualities.

" 2. The quantity of metal which each individual iron-ſtone may contain, is another object of conſideration. Beſides the proportion of mixtures, which chiefly contribute to the fuſibility of iron-ſtones, a ſecond degree of fuſibility is dependent upon the richneſs of the ore in iron; this is ſo obvious in the uſe of the Cumberland and Lancaſhire ores, that the conſequences of their introduction will be perceived, by the change of the ſcoria and metal, in half the time that change would be effected by ordinary iron-ſtones. It has been frequently noticed, that crude iron contained pure carbone in proportion to its fuſibility; then the more fuſible or ſupercarbonated qualities muſt take up, comparatively, a conſiderable portion of the carbonaceous principle from the fuel. From this reſults a ſtriking conſequence, that the quantity of fuel ſhould, over and above its relation to the mixtures, bear a juſt proportion to the quantity of iron in the ſtone: for example, let the weight per charge of fuel at a blaſt furnace be 400lb. and let this be ſuppoſed ſufficiently to fuſe and carbonate the iron contained in 360lb. of iron-ſtone; let the quantity of metal be ſuppoſed 35 per cent. then the produce will be 126 lb. Should a change take place, and iron ſtone richer in iron be applied, though the ſame by weight, and ſhould this iron ſtone yield of torrefied ſtone 45 per cent. its produce will be 162lb. or 40lb. more than the former. As there exiſts no greater proportion of carbone in the furnace, it is evident that the exiſting quantity, being diſtributed over nearly one-third of more metal, muſt therefore be in more ſparing quantity in the whole, and the value of the metal conſequently reduced.

Quantity of fuel to be proportionate to the richneſs of the ore.

" 3. The weight of oxygen contained in iron ſtones is the next object of ſerious conſideration. I have already ſhewn, from experiment, that our iron ſtones naturally contain from 9 to 14 per cent. of oxygen, which remains after torrefaction; it has alſo been ſhewn, that this quantity of hurtful mixture may be eaſily doubled by over-roaſting or under-roaſting the ſtone; and that the bad effects entailed are in the ratio of its combination with the iron. From a review of the facts which have been adduced on this ſubject, its agency and effects will eaſily be credited by men of ſcience; its property of conſtituting the acidifying baſe of all the ..ids readily explains the unalienable conſequence of its preſence with acidifiable baſes. The effects are ſtill more pernicious when the oxygen is furniſhed by the decompoſition of water in raw iron ſtone; the hydrogen in this caſe, ſet free, alſo ſeizes a portion of the carbone; and theſe abſtractions, united to that produced by the native portion of oxygen in the ſtone, form an aggregate which frequently reduces the value of iron 40 per cent. So long as the principles of ſcience are overlooked in the manipulations of the foundery and forge, the exiſtence of ſuch agents will be treated as chimeras of the philoſopher and chemiſt, and the effects hourly produced by them induſtriouſly attributed to cauſes which, in point of unity or conſiſtency, will not bear the ſlighteſt touch of inveſtigation*."

* *Phil. Mag.* vol. v.

The compreſſion, velocity, and effects of the air are of the utmoſt importance in blaſt furnaces. The production, management, and direction of theſe effects are therefore ſerious objects of conſideration to the manufacturer of iron, ſince on their proper application the ſucceſs of his operation chiefly depends. And here we ſhall renew our obligations to Mr Muſhet for his intereſting obſervations on this ſubject. " When it is conſidered," he ſays, " that in the ſmelting operation the reduction of immenſe quantities of materials is effected by a compreſſed current of air impelled by the whole power of a blowing machine, the conſequences of the change of air, either in quantity or quality, muſt be very obvious: when, farther, we contemplate the metal called into exiſtence by means of combuſtion thus excited; when we conſider iron as having the moſt powerful affinity for the baſe of that part of the air which maintains combuſtion; and when we view the debaſed ſtate to which the metal is reduced by coming into improper contact with it, we muſt conclude, that the application of blaſt in the manufacturing of iron calls for the moſt minute and thorough inveſtigation. In order to take a comprehenſive view of this ſubject, the following diviſion will be requiſite:—

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" 1ſt, The intimate connection which the quantity of blaſt bears to the area of the internal cavity of the furnace, and to the nature of the pit-coal.

" 2d, The various modes by which air is procured, and how theſe reſpectively affect the quality of the air.

" 3d, The various changes to which air is ſubjected by a change of temperature in the atmoſphere, with the conſequent effects.

" 4th, How far increaſed or diminiſhed velocity and compreſſion alter the reſults of the furnace.

" 5th, The form and diameter of the diſcharging-pipe.

" 1ſt, Then, in the conſtruction of a blaſt-furnace and blowing-machine, the quantity of air to be uſed ought to depend upon the internal dimenſions of the former; which, again, ought to be formed according to the quality of the pit-coal. Upon the ſoftneſs or hardneſs of the coal, ought more immediately to depend the height of the blaſt-furnace. This neceſſary precaution has given riſe to a vaſt variety of furnaces, of different capacities, from 30 to 50 feet in height, and from nine to 16 feet diameter at the boſhes. Furnaces from 30 to 36 feet are uſed for the ſofter qualities of coal, ſuch as a mixture of free-coal and ſplint. Furnaces from 36 to 45 are appropriated to the burning of ſplint-coal cokes; and in Wales, ſuch is the ſuperior ſtrength and quality of the pit-coal, that the furnaces admit of being reared to the height of 50 feet.

Quantity of air regulated by the conſtruction of the furnace; and this depends on the nature of the coal.

" Theſe various qualities of coal, it has been formerly ſhewn, have appropriate weights of iron-ſtone, and, to uſe the language of the manufactory, are capable " of ſupporting a greater or leſs burden of mine." The former qualities admit not of having the air diſcharged in great quantity, unleſs it is impelled under an uncommon degree of compreſſion and conſequent velocity, incompatible with the operations of a ſteam-engine. The reaſon is obvious: when air, looſely compreſſed, or comparatively ſo, is thrown into a body of ignited fuel, the mechanical ſtructure and continuity of whoſe particles are ſoft, the air is much more eaſily decompoſed; the ignition, of courſe, is more rapid: the deſcent of the materials is promoted beyond their proper ratio, and long

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long before the carbonaceous matter has penetrated the ore, or united to the metal, to conſtitute fuſibility. I ſhall adduce an example, as being the moſt illuſtrative of this doctrine.

Illuſtrated by an example.

"Suppoſe a blaſt furnace, 35 feet high, 11 wide at the boſhes, properly burdened, and producing N° 1. pig-iron. Let the diſcharge of the air be ſuppoſed equal to a preſſure of two pounds and a half upon the ſquare inch, or equivalent to one-ſixth of the atmoſphere, or five inches of mercury: under theſe circumſtances let it farther be ſuppoſed, that 1500 cubical feet of air are diſcharged in one minute; and that the diameter of the diſcharging pipe is 2.625, the area of which is equal to 6.890625 circular inches. Let the diſcharging pipe be increaſed to three inches diameter, and let the ſame quantity of air be paſſed into the furnace; it is evident that as the area of the diſcharging pipe is increaſed to nine circular inches, or nearly one-third more than formerly, the compreſſion of air muſt be proportionally diminiſhed. The alteration is ſoon perceived by its effects; the quantity of ſcoria increaſes from the furnace, whilſt the conſumption of the materials above is alſo conſiderably augmented. In a few hours the ſcoria will have undergone a complete change, from pure white, enamelled with various blue ſhades, to a green, brown, or black colour, conſiderably charged with the oxide of iron (G). The ſame effects will continue, in greater or leſſer degree, till all the materials are reduced which were exiſting in the furnace at the period of diminiſhed compreſſion. The philoſophy of this fact may be inveſtigated in the following manner:—

"While the juſt aſſociation of proportions remained, the air was diſcharged under ſuch a degree of compreſſion as to excite proper combuſtion: the decompoſition of the air by means of the ignited fuel, was not effected in immediate contact with the ſeparating metal, but had, by its uncommon degree of denſity, reſiſted decompoſition in the ignited paſſage, and had been decompoſed upon the cokes at a greater elevation in the furnace. As a proof of this, we frequently ſee a tube formed throughout the whole breadth of the furnace, quite black and apparently cold, formed of the fuſed materials: when this is removed, a conſiderable deſcent momently takes place of cokes heated viſibly beyond the common pitch: theſe inflame rapidly, but are ſoon again cooled to blackneſs by the inceſſant diſcharge of air upon them. The deſcending mixture of iron and lava is in like manner cooled along the line of blaſt; the tube is again formed, and, if not removed, will remain for days together, while the furnace will be otherways working in the beſt manner.

"When by accident or deſign the compreſſion and velocity of blaſt are diminiſhed, the tube begins to burn, and throws off a great many fiery-coloured ſparks, the ſides and roof fail, and are carried before the blaſt in all directions. Sometimes conſiderable clots of imperfect iron are recoiled with ſuch violence as to eſcape the vortex of blaſt, and iſſue from the tuyere-hole with ſuch velocity as to inflame the air, and fall down in the ſtate of oxide. In the end the tuyere will appear to flame, and all the paſſage inwards ſhews an aſtoniſhing degree of whiteneſs. The decompoſition of the air is inſtantaneouſly effected upon its entering the ignited paſſage; the iron by this means is expoſed to the oxygen that is diſengaged; and the vaſt quantity of caloric ſet free, in conſequence of its union with the iron and carbone, produces the aſtoniſhing heat now viſible, but which formerly took place at a more proper height in the furnace.

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"From this it will appear, that although a greater apparent degree of heat is viſibly produced by the ſudden decompoſition of the air, and a more rapid deſcent of materials for ſome time is the conſequence, yet, as the quality of the iron is impaired, and as in the end the furnace will return to its old conſumption of materials as to quantity, the effects of a looſe ſoft blaſt are obviouſly pernicious.

Pernicious effects of moiſture in the air or in the fuel.

"It ſometimes happens, that when a looſe blaſt is ſurcharged with a conſiderable portion of moiſture, or comes in contact with cokes which had been wet when introduced into the furnace, the inflammation which takes place at the tuyere is prodigious: fine fire clay will be melted down and blown to ſlag in a few minutes; the ſides of the furnace, compoſed of very infuſible fire ſtone, is next attacked, and in a few hours will be ſo completely deſtroyed as to ſtop the working, and require immediate repair. Effects ſimilar to thoſe now deſcribed will be felt when the blaſt is improperly proportioned to coal of a ſtronger continuity of fracture and ſuperior quality. Beſides the effects produced by the ſudden decompoſition of iron, others of like nature are produced where a ſoft coal is uſed, a ſmall furnace, and a great diſcharge of blaſt.

"It has been found that crude iron, to be properly matured, ought to remain in the blaſt furnace, according to circumſtances, 48 to 60 hours; that is, from the period that the iron ſtone is introduced till ſuch time as the metal begins to occupy its place in the hearth in a ſtate of perfect ſeparation. When the contrary is the caſe, the mixtures arrive at the hotteſt parts of the furnace before the metal has taken up a ſufficient quantity of carbone from the fuel; the action of the blaſt, and the immediate heat by which the ore is ſurrounded, forces the iron from its connections to the bottom of the furnace. The quality is de-carbonated, and reduced in its value: to reſtore this again, the local portion of fuel is increaſed; this adds to the expence of manufacturing, and diminiſhes, in ſome meaſure, the ſmelting of the furnace.

"When ſplint-coal cokes are uſed in the blaſt furnace, the blaſt admits of being thrown in under the higheſt poſſible pitch of compreſſion; the uncommon denſity of the charcoal ſuſtains a very powerful diſcharge of blaſt before it is diſſipated to facilitate the general deſcent. Moſt frequently, large maſſes of theſe cinders paſs through the whole ignited cavity, and are thrown out below, poſſeſſing all the acuteneſs of their original form and fracture.

"This quality of coal is uſed in all the Curſon blaſt furnaces, where, to enſure a reſpectable produce, the air is diſcharged under a preſſure equal to $3\frac{1}{4}$ pounds upon the ſquare inch, or $6\frac{1}{2}$ inches of mercury.

(G) "The metal will have loſt nearly all its carbone, and have become inferior in value 25 to 30 per cent.

Furnace.

" The ſame quality of coal was uſed at the Devon iron works, where at one time, having all the blaſt of a 48 inch cylinder engine thrown into one furnace, the column of mercury ſupported was upwards of ſeven inches; the quantity of air diſcharged under ſuch an impelling power, I found to exceed 2600 cubical feet per minute.

" The coals uſed at the Cleugh, Cleland, and Clyde iron works, are nearly of the ſame quality at each—a mixture of ſplint and ſoft coal. The Muirkirk and Glenbuck iron works have a coal different from any of the former, and in ſome particular ſpots it conſiderably reſembles the Engliſh clod coal.

Methods of directing air into the furnace,

" 2d, The various methods of procuring air for the blaſt furnace may be reduced to the following:—1ſt, That procured by cylinders, and diſcharged into the furnace by means of a floating piſton heavily loaded, and working in a large receiver or regulating cylinder: 2d, That wherein pumping cylinders only are uſed, and the air thrown into cheſts inverted in water, called the *water vault*: 3d, That mode wherein the air is diſcharged from the pumping or forcing cylinder into an air-tight houſe, called the *air vault*.

by cylinders and water blowing machines;

" The firſt method is the original mode of blowing, and is ſtill much uſed at thoſe iron works whoſe erection has been prior to the laſt fifteen years. By this mode the quality of the air is leſs ſubject to alteration by a change of atmoſphere. The principal objection to this manner of blowing, is the want of capacity in the receiving cylinder; which cannot be increaſed ſo much as to take away the conſiderable intervals which occur at different parts of the engine ſtroke. This effect is ſenſibly ſeen by the ſpeedy and irregular aſcent and deſcent of the column of mercury. In water blowing machines, where the air is raiſed by three or four cylinders worked by means of a crank, and where the air is received into an air cheſt, and forced into the furnace by the continual action of the blaſt of each ſucceſſive cylinder, the current of the air is ſteady, and ſupports the column of mercury with great uniformity.

by means of the water vault.

" The uſe of the water vault has of late years become very general among new erected works. Its properties are, a ſteady and very cold blaſt: the largeneſs of the receiving ciſterns gives them a ſufficient capacity to retain every pound of air raiſed by the furnace, and diſtribute it to the greateſt advantage. This is not the caſe with the floating piſtons, where a certain quantity of ſpare wind is thrown out at every return of the engine, leſt the great piſton and weight ſhould be blown out of the cylinder altogether; which, indeed, ſometimes happens. The only objection which remains in force againſt the uſe of the water-vault, is the tendency which the air has to take up a conſiderable portion of water in ſolution, and introduce it into the furnace. A judicious arrangement of the conducting pipes would in ſome meaſure obviate this, as well as the more dangerous tendency which water has to riſe in a pipe ſpeedily emptied of its air by the ſtopping of the engine: a ſtream of water thus conveyed to the furnace, would be productive of the moſt awful conſequences.

The air vault.

" The air afforded by the air vault is much inferior to that obtained in the former methods. This immenſe magazine of compreſſed air generates a conſiderable portion of heat, which greedily ſeizes the damps, which are unavoidable in underground excavations, and conveys them to the furnace. The blaſt is, however, ſteady and uniform; and when the inſide of the building is completely ſecured againſt the paſſage of air, it is productive of conſiderable effects in the furnace. In the ſummer months, however, the air becomes ſo far debaſed as to affect the quality of the iron, and change it from gray to white. Every change in the temperature of the atmoſphere during this period, is indicated by various changes in the furnace. Furnace.

" The largeſt air-vault hitherto in uſe was excavated out of ſolid rock at the Devon iron works: the fiſſures of the rock admitted conſiderable quantities of water; and the ſame degree of damp would always prevent the poſſibility of making the ſide walls and roof air-tight by means of pitch and paper, &c.

Quality and ſtate of the air conſidered.

" Beſides the various natures of blaſt, as to the ſtrength and equality of the current afforded by different modes of conſtructing the blowing machines, a variety in the quality of the air obtained is alſo an invariable conſequence: this is ſufficiently known by the effects which it produces in the blaſt furnace, and ought to be ſubject to ſcrupulous examination.

" In this, as in other countries, larger produces of caſt iron are obtained in the winter months than during the ſummer and autumn ſeaſons: the quality of the metal is alſo much more carbonated, and with a leſs proportion of fuel. In many parts of Sweden, where the ſummer heats are intenſe, the manufacturer is obliged to blow out or ſtop his furnace for two or three months: not only is he unable to make carbonated metal, but is frequently incapable of keeping the furnace in ſuch trim as to make a produce of any quality whatever. In Britain, during the months of June, July, and Auguſt, more eſpecially in dry ſeaſons, the quality of the iron, with the local proportion of fuel, will be depreciated 30 per cent, and the quantity reduced to two-thirds or three-fourths.

" In ſeeking for a ſolution of this univerſally acknowledged fact, our attention is naturally directed to an examination of the various ſtates of air. That the quality of the air in winter is more fit for combuſtion than in ſummer, is a truth which requires no farther demonſtration. Greater coolneſs, whereby an almoſt complete refrigeration of moiſture takes place, and the preſence of perhaps a greater relative proportion of oxygen, may account for this phenomenon. On the contrary, the quality of air during the ſummer months becomes much contaminated for combuſtion, by holding in ſolution a much greater quantity of moiſture: the abundance of nitrous particles may alſo diminiſh the uſual proportion of oxygen.

" This will account for the inferior effects of combuſtion both in common fires and in the blaſt furnace; it will alſo in a great meaſure tend to ſolve the curious phenomenon of the pig-iron taking up leſs carbone in ſummer, although reduced with a ſuperior quantity of fuel. The air diſcharged moſt probably contains leſs oxygen; yet the metal is much leſs carbonated than at other times, when contrary proportions of theſe exiſt. Moſt probably the deficient carbone is carried off by diſſolving in hydrogen, forming a conſtant ſtream of hydro-carbonic gas, while the oxygen that is ſet free unites to the iron; and while it reduces its quality, at the

rnace. the ſame time the quantity is reduced by a portion of the metal being loſt in the ſcoria (H).

t is not ficiently ended to. "To correct theſe occaſional imperfections in the quality of the air, and to deviſe methods to procure air always fit for proper combuſtion, ought to be an object of much conſideration to the manufacturer of caſt iron. Whether ſuch a conſideration has given riſe to the different modes of receiving and diſcharging the air now in uſe, I cannot ſay; I rather think not: a great quantity of air has hitherto been a greater object than a certain and uniform quality; and in a country where there is more temperate and cold weather than hot, it is by far the moſt important object: to unite both, however, would be an attainment of the greateſt utility, and would rank the diſcoverer amongſt the well-deſerving of his country. How far the mechaniſm of our preſent machinery has been adapted to the exigencies of our atmoſphere, will appear upon examining the nature and properties of the air, judged by its effects upon the blaſt furnace.

ects of air from cylin- "The air produced by the blowing and receiving cylinder is leſs changed, and leſs ſubject to change, than that produced and lodged in contact with a vaſt body of air or water. If the blowing cylinder is fixed in a dry cool ſpot, the only difference which the air undergoes is an increaſe of temperature; this is ſo very conſiderable, that upon entering the blowing cylinder immediately after ſtopping the engine, I have found the thermometer riſe 15 to 17½ degrees higher than the ſurrounding air. That this heat is generated in the cylinder is unqueſtionable; but whether it is occaſioned by the friction of the piſton leather upon the ſides of the cylinder, or expreſſed from the air by its ſevere compreſſion, I have not yet been able to decide. It very probably ariſes from both cauſes, although the latter is ſufficient to produce a much greater degree of heat. What effect this increaſe of temperature has upon combuſtion we are unable to ſay, as the degree of heat accumulated will at all times bear a reference to the temperature of the ſurrounding air, and as there is no method likely to be deviſed where heat would not be generated by the action of the particles of air upon each other. When the bulb of a thermometer is held in the middle of the current of blaſt, as it iſſues from the diſcharging pipe, a temperature is indicated as much lower than the temperature of the ſurrounding air, as the temperature of the cylinder was higher; and it is moſt probable that a much lower degree would be obtained, were it not for the previous expreſſion of ſome heat in the blowing cylinder. Upon the whole, I think, the quality of the air obtained in this way of blowing uniformly moſt fit for combuſtion, provided the numerous pauſes and irregularities of the current of air were done away.

Fr the wer va "Air forced into the furnace under water preſſure always contains a conſiderable portion of moiſture; the blaſt of courſe is colder, as it iſſues from the diſcharging pipe. The temperature differs ſo much from that of the external air as to ſink the thermometer from 54° down to 28° and 30°. Such effects are produced by air coming into contact with water, that, although the temperature of the atmoſphere is 60, 65, to 70, yet the blaſt at the orifice ſeldom riſes above 38: the cold produced in this manner is much increaſed if the air is ſurcharged with ſo much water as to be viſible in the ſtate of a fine ſpray. The leading feature, therefore, of the water vault, as to its effects upon the quality of the air, ſeems to indicate an almoſt uniform degree of temperature in the blaſt: this can only be occaſioned by the warm air in ſummer taking up a greater portion of the water in ſolution, the eſcape of which at a ſmall orifice, and under a great degree of compreſſion, produces the very great depreſſion of the thermometer. I have already hinted at the bad effects produced by moiſt blaſts, and ſhall, in a proper place, more minutely attend to them. Furnace.

From the air vault. "The moſt inferior quality of air uſed in the blaſt furnace is that thrown into the air vault, and afterwards expreſſed from thence by its own elaſticity and the ſucceſſive ſtrokes of the engine. The capacity of ſuch a building is from 60 to 70,000 cubical feet; this, when filled, generates a much ſuperior degree of heat to that ſenſible in the blowing cylinder. As this heat is produced many feet diſtant from any mechanical motion, it is moſt evident that it is extricated from the air, and will readily unite with the moiſture which penetrates the building: the quality of the air introduced into the furnace will therefore be in proportion to the quantity of moiſture taken up; this will be much more in ſummer than in winter, as the temperature of the former exceeds that of the latter. The ſenſation, on entering the air vault in the coldeſt months, immediately after ſtopping the engine, is exactly ſimilar to that experienced upon entering a crowded room in the hotteſt ſummer day; the walls are covered with damp, and the ſuperior regions of the vaults readily obſcure the flame of a candle. The feeling, upon remaining in the air vault when the engine is at work, is leſs marked than would be expected where ſo great a compreſſion of air exiſted; the ſenſe of hearing, owing to the moiſture in the conducting medium, is conſiderably impaired, and reſpiration is performed with ſome difficulty; the light of a candle is faint, and not viſible at the diſtance of a few feet.

"I have explained the neceſſity of juſt proportions exiſting betwixt the area of the interior of the blaſt furnace, the quantity of air thrown per minute, and the the quality of coal. The various modes of blowing, and their reſpective effects, deduced from ſtrict obſervation, were alſo attended to. We have now, thirdly, to adduce examples where the various changes of the atmoſphere, as to heat and preſſure, occaſion the moſt ſenſible difference in the quantity of materials conſumed, and in the quality and quantity of metal produced.

"It has been already demonſtrated, that the air in winter, by containing leſs moiſture, is more proper for combuſtion, and more calculated to produce carbonated crude iron, than the air exiſting at any other ſeaſon. From this ſuperior quality the manufacturer obtains advantages, which induce him to wiſh for a continuance of

(H) "May not the ſuperabundant azote of the ſummer atmoſphere produce part of theſe effects, by diſſolving a portion of the carbone, and forming carbonated azotic gas, as has been proved by M. Lavoiſier."

Furnace.

of cool air throughout the whole year. Theſe effects are not, however, uniform; they depend greatly upon a light or heavy atmoſphere. The keener and more ſtill the air, the more rapid the combuſtion. During a ſevere froſt, the deſcent of the materials is facilitated from one-tenth to one-fifteenth more than in rainy or hazy weather, and at the ſame time the quality of the iron is rather improved than impaired. When a change from froſt to ſnow or rain takes place, the effects frequently become almoſt immediately obvious; the colour of the flame at the furnace head is changed; the tuyere of the furnace inflames, and burns with great violence; the lava, as it flows from the notch of the dam ſtone, becomes lengthened and tenacious; the form of it is changed, and the colour undergoes the moſt viſible alterations; the iron no longer retains its complete ſaturation of carbone, but flows out ſenſibly impaired of its fluidity; and, when cold, the privation of carbone is moſt evident by the examination of its fracture.

Effects of a change of weather.

"When ſuch conſequences ariſe from the tranſition ſo frequent in winter from froſt to thaw, it will be eaſily conceived that the change effected during the milder and warmer months muſt produce proportionally additional effects. The increaſe of temperature by taking up, and holding in ſolution, a much greater portion of aqueous vapour, will account for the ordinary effects which are annually obſervable in every work. Where theſe pernicious conſequences approach to extremity, a ſolution of the phenomenon will likely be obtained by the examination of the blowing apparatus. If air is fitted for combuſtion in proportion as it is free from watery ſolutions, we are not to expect ſimilar reſults from theſe blaſt furnaces in ſummer, which are blown by air from the regulating cylinder, and thoſe blown by air from a water or air vault. I have for years ſeen this fact verified, and ſuperior quantity and quality of iron during the hot weather, obtained from a furnace excited by means of blaſt, from the ſimple regulating cylinder, with a leſs proportion of fuel than from furnaces whoſe air was expreſſed by means of the water or air vault. Obſervations thus made, where every day the effects of the different means could be juſtly eſtimated and compared, have led me to the following concluſion: That the quality of the air, as furniſhed us by nature in our atmoſphere, is uniformly more fit for the manufacture of crude iron to profitable account, when diſcharged ſimply by means of cylinders and piſtons, than when brought into contact with moiſture either in the water vault or air vault.

Air from cylinders preferred.

"So imperfect has the quality of the ſummer air been found in this country for combuſtion, where the water vault was uſed, that experiments have been made to repair the deficiency of effect by introducing ſteam into the furnace by means of an aperture above the tuyere. The inducing motive to this act, was a belief, that combuſtion was diminiſhed in conſequence of a diminution of oxygen gas during the ſummer; that, by introducing water upon a ſurface of materials ignited to whiteneſs, decompoſition would enſue, a larger quantity of oxygen would then be preſented to the fuel, and ſuperior effects, as to combuſtion, obtained in this manner than hitherto witneſſed. The idea was ingenious, and, in its application to the manufacture of caſt iron, original; but the whole train of facts, which have been detailed, as to the effects of a ſuperabundant quantity of oxygen, was overlooked. The event proved in the moſt complete manner, and on a great ſcale, the pernicious effects of moiſture. The furnace gradually became cooled where the ſteam entered; the heat, ſet free by the decompoſition of the water and the diſengagement of the oxygen, increaſed to an alarming pitch a conſiderable way up the furnace; the quality of the iron became brittle, and as white in the fracture as ſilver; the introduction of the ſteam was ſtill continued, the deſcending materials were inſtantly robbed of their heat to facilitate the decompoſition of the water, and by and by the furnace cloſed entirely over, and the experiment ceaſed. Furnace.

"This experiment, performed in a furnace 18 feet high, is a complete proof that heat is diſengaged from bodies while they paſs from the fluid to the aëriform ſtate. The firſt inſtant of the diſcharge of ſteam, a very conſiderable portion of heat would be withdrawn from the fuſing materials and united to the water. This, in its turn, would be ignited to whiteneſs, and decompoſed upon the metals and cokes, in a ſuperior region of the furnace. The proceſs continuing for ſeveral hours, the materials at the tuyere were at laſt ſo completely deprived of the caloric by the continual torrent of ſteam, that they loſt fluidity, cooled rapidly, and at laſt became black. Had another aperture for ſteam and for air been opened above theſe, now entirely ſhut up by the conſolidated materials, the ſame effects would have been produced; the immenſe quantity of caloric, diſengaged by the decompoſition of the ignited water, would now approach nearer to the top of the furnace, another ſtratum of fuſing materials would again become conſolidated, till in the end the whole furnace would be ſet faſt from top to bottom. From the introduction of ſteam into the blaſt furnace, either as ſuch, or under a ſuperior degree of expanſive force, the following important truths may be learned: That the quantity of oxygen which enters into our atmoſpheric compound is generally more fit for the manufacture of the ſuperior qualities of crude iron than any mixture which may be furniſhed by the addition of water: that, although the decompoſition of water, by furniſhing a ſuperior quantity of oxygen, and by throwing off a relative proportion of caloric, increaſes the effects of combuſtion immediately in the vicinity of this chemical analyſis; yet, as the water had previouſly abſtracted the heat neceſſary to its decompoſition from the inferior ſtrata, a greater quantity by no means exiſts in the furnace. The water, in fact, only ſerves as a medium to convey the heat from one particular ſpot; but, by attempting to fly off with it, meets decompoſition, and renders up not only the abſtracted heat, but that which was contained in the oxygen of its decompoſition.

"4th, The compreſſion and velocity of the air diſcharged into the furnace, conſiderably affect the reſults of the ſmelting operations. In the conſideration of this ſubject, the various qualities of coals will be found to have an intimate connection with the area of the diſcharging pipe and the compreſſion of the blaſt. It has already been more than once obſerved, that a ſoft or mixed quality of coal is more ſuſceptible of combuſtion than either the ſplint or clod coal: the conſequence of this is, that, unleſs the neceſſary compreſſion of air is uſed, decompoſition is too early accompliſhed, and the cokes become oxygenated by combuſtion in a greater Compreſſion and velocity of the air conſidered.

Furnace. ratio than is proper for the carbonation of the metal. To avoid this, the column of air ought to be diſcharged, in the caſe of ſoft coals being unavoidably uſed, under ſuch a degree of compreſſion, as to reſiſt entire decompoſition in the ignited paſſage. In that caſe, the iron does not ſo immediately come into contact with oxygen, as the decompoſition is chiefly effected in the ſuperior ſtrata of the ſeparating materials. Under the former circumſtance, of a looſe unconnected ſtream of air being thrown upon cokes eaſily combuſtible, the quality of the metal, with the ſame quantity of fuel, becomes oxygenated, the tuyere becomes fiery, and frequently emits ſparks of metallic oxyde. The ſeparating iron may be viewed as it oozes from the ore in ſmall globular maſſes, frequently on fire, changing its ſtate to that of an oxyde. The combination of oxygen, by altering its denſity, makes it ſubject to the re-action of the blaſt, which at times gives it a direction from the tuyere with conſiderable violence. Thoſe parts of the iron (by far the greateſt) thus oxydated, which eſcape not at the tuyere, mix along with the fuſed earths of the ores and limeſtone, alter their colour, and flow from the furnace more unrevived than at their firſt introduction. It is, however, very different, even with this inferior quality of coal, where the denſity of the blaſt is proportioned to the inflammability of the fuel. Qualities and quantities of crude iron may be produced from this, equal to thoſe from coals reckoned of a ſuperior nature. The metal becomes as highly ſaturated with carbonic principle as that made from clod or ſplint coal. The tuyere evinces that decompoſition is effected in its proper place. The fluid maſſes of iron, as they become expreſſed from the ore, are ſhivered into ſpray, before the denſe column of air, without exhibiting the leaſt ſymptom of decompoſition. They again unite under the level of the blaſt, increaſe in ſize, and ſink through the fluid ſtratum of earths to the bottom of the furnace. This fact holds out one of the ſtrongeſt proofs of the great affinity which carbone and iron mutually poſſeſs towards each other. In the caſe of the iron ſeparating in an oxygenated ſtate deſtitute of carbone, it immediately falls a prey to its affinity for oxygen. In the latter caſe, the iron, being completely carbonated, reſiſts decompoſition by the ſacrifice of a very ſmall portion of its carbone. It further proves, that the affinity of oxygen is greater to carbone than to iron; and that, before iron becomes oxydated, all the carbone is taken up.

"The continuity of the particles of ſplint coals renders the cokes of difficult combuſtion, capable of withſtanding a moſt powerful diſcharge of air, in quantity and in the degree of compreſſion, without entailing effects ſimilar to thoſe produced with the uſe of ſofter coals: this renders the operations with ſplint coal leſs ſubject to caſuality and to change. Carbonated iron with a proper blaſt is more uniformly obtained, and frequently a very ſuperior quantity. Similar effects are produced with the clod coal, but in a more eminent degree. Diſcharging pipes are uſed four inches in the diameter, and the compreſſion only equal to two pounds on the ſquare inch; yet the ſame fatal effects are not known as in the uſe of ſoft coal, which, with ſuch a column of air, would require the preſſure to be equal to three pounds and a half upon the ſquare inch at leaſt.

"5th, Upon the form and conſtruction of the diſcharging pipe effects of more conſiderable importance depend than is either generally allowed or even conceived. At ſome iron works, no peculiar ſhape is adopted: if the tube is ſufficient to convey the air, and the mouth of it nearly of the ſize wanted, the interior conſtruction is entirely overlooked. This indifference, however, is by no means general: variouſly conſtructed pipes are uſed at different works, and at ſome places it is preferred to throw in the air from two pipes whoſe areas are only equal to one of the uſual ſize. Furnace. Form of the diſcharging pipe important.

"To underſtand properly the objectionable parts of the conſtruction of noſe pipes, it muſt be recollected, that much has been ſaid to depend upon the blaſt reaching the oppoſite extremity of the furnace, as little impaired of the compactneſs and velocity of its original diſcharge as poſſible. When it is otherwiſe, the reſults in the internal operations of the furnace muſt be conſequently altered. If the compreſſion is diminiſhed one-half or two-thirds when it reaches the oppoſite wall, decompoſition in that portion muſt be effected before the air has attained its elevated ſituation in the furnace. It is even poſſible to diſperſe the whole column of air in ſuch a manner that the ignited materials of the oppoſite ſide may receive little of its effects to promote combuſtion.

"A diſcharging pipe is frequently uſed, in length 12 inches or more, the diſcharging aperture 3 inches, the other end 5 inches; but this is arbitrary, depending upon the ſize of the adjoining pipe. From a pipe thus conſtructed, the air diſperſes or diverges too ſuddenly; and at a ſmall diſtance from the orifice, a conſiderable portion of it anſwers but imperfectly the purpoſes of combuſtion. Part of it is ſpeedily decompoſed, and the oxygen brought into immediate contact with the iron. The quantity of metal is reduced by the former, and the quality injured by the latter. Though long cuſtom, by a continued uſe of ſuch ſhaped pipes, has prevented their pernicious effects from being obſerved, yet they muſt prove in many caſes detrimental to the economical diſtribution of air, and the manufacture of iron.

"A noſe pipe, of another conſtruction, even more exceptionable, is alſo uſed; and the air diſperſes ſtill more ſuddenly, in a degree ſomewhat proportionate to the more ſudden contracting of the pipe, a conſiderable quantity never enters the furnace, but, ſtriking on the exterior wall, is thence repelled.

"A diſcharging pipe, of the following conſtruction, would obviate, in a great meaſure, the imperfections of the two former: the length of the tapered piece is 12 inches, of the ſtraight pipe, ſix inches; extreme diameter, as in the others, five inches; diameter of ſtraight pipe, three inches. From ſuch a pipe it is conceived that the blaſt will proceed to the greateſt poſſible diſtance unimpaired in compreſſion and velocity. So far, therefore, as the abſolute force of the blaſt and breadth of the furnace will permit, decompoſition will be prevented on the level of the pipe, and the manufacturer freed from the evils which I have above detailed, as attendant upon decompoſition in that quarter." Beſt form of conſtruction.

The following is a deſcription, alſo taken from Mr Muſhet, of an air and a water vault which is employed to equalize the diſcharge of air into a blaſt furnace. Deſcription of an air and water vault.

"Fig. 7. repreſents a vertical ſection of the elevation of an air vault 60 feet long and 30 feet wide, conſiſting Fig. 7,

of

Furnace. of four arches of regularly progreſſive ſizes. This building is generally conſtructed under the bridgehouſe, where the materials are daily collected for filling the furnace. AB, repreſents the acclivity to the furnace top. The ſpace betwixt the arch tops and the level of the floor is filled with materials as denſe as can be procured. The walls of the under part are three feet thick, beſides a lining of brick and plaſter from 18 inches to two feet. Still further preeautions are neceſſary, and alternate layers of piteh and ſtout paper are requiſite to prevent the eſcape of the compreſſed air. C, a view of the arched funnel whieh conveys the air from the eylinder to the vault. Large iron pipes with a well fitted door, are preferable, and leſs apt to emit air. D, an end view of the pipe by which the blaſt is carried to the furnace.

Fig. 8. "Fig. 8. is a horizontal ſection of fig. 7. at the dotted line *ab*, repreſenting the width of the croſs arches, which are thrown in each partition to preſerve an eaſy communication betwixt the vaults. D, is a ſection of the firſt range of pipes, meant to conduct the air to the furnace. In like manner pipes may be taken off from any part of the vault for the different purpoſes of blowing furnaces, fineries, hollow fires, &c.

Fig. 9. "Fig. 9. repreſents a vertical longitudinal ſection of what is generally called the water-vault. The walls of this building may be erected to the height of eight or nine feet, their thickneſs ſimilar to thoſe of the air vault. A brick lining, and even puddling with clay betwixt it and the ſtone building, is neceſſary to prevent the water from oozing by the accumulated preſſure. A, is an end view of the horizontal range of pipes which conveys the blaſt from the blowing cylinder to the inverted cheſt. BBB, the range which conducts the air to the interior of the inverted cheſt, and conveys it to the furnaces, proceeding along the extremities of the columns broken off at BB. C, an inverted cheſt made of wood, iron, or even of well-hewn flags ſet on end and tightly eemented, is 54 feet within in length, 18 feet wide, and 12 feet high. The dimenſions, however, vary at different works. When the cheſt is made of wood or iron, it is generally bolted by means of a flange to the logs on which it is ſupported, leſt the great preſſure of the air ſhould overcome the gravitation of the cheſt, and diſplace it. DD, view of the eentre log, and ends of the croſs logs, on which the cheſt is laid. Theſe ſhould meaſure 18 inches in height, ſo as that the mouth of the cheſt may be that diſtance from the ſurface of the floor, and the water allowed to retreat from the interior of the cheſt with the leaſt poſſible obſtruction. EE, the outſide walls of the building. FF, the brick-works, made perfectly water tight. The dotted line G, repreſents the ſurface of the water when at reſt. Let the depth of the water, outſide and inſide of the eheſt, be eſtimated at four feet. When the engine is at work, ſhould the preſſure of the air have foreed the water down to the dotted line H, three feet and a half diſtant from the line G, and only ſix inches from the mouth of the cheſt, it follows, that the water muſt have riſen in the outer building, or cheſt, three feet and a half above G, and have its higheſt ſurface nearly at reſt at I. In this caſe the ſtrength of the blaſt is reckoned equal to ſeven feet of water, or nearly ſix inches of mereury. The ſpace betwixt the cheſt and outſide building is three feet. When the engine is at reſt, and the water has aſſumed its level, the quantity of water within the cheſt ſhould be equal to that without. Furnace.

Fig. 10. "Fig. 10. is a ground plan of fig. 9. The croſs logs on which the ciſtern is ſupported are dotted within, but drawn full in the ſpaee betwixt the flange of the cheſt and outer building. The breadth of the flange-tops of the binding bolts, and thickneſs of the metal of the cheſt, are alſo drawn. The letters bear a reference to thoſe in fig. 9."

Singular phenomena obſerved in an air vault. An account of ſome curious phenomena obſerved by Mr Roebuek in the air vault of a blaſt furnaee has been publiſhed in the 5th volume of the Tranſactions of the Royal Society of Edinburgh. This, as well as ſome remarks of practical utility on the management of blaſt furnaces, we doubt not, will be intereſting to our readers. We ſhall therefore give it in his own words. It is addreſſed in the form of a letter to Sir James Hall.

"I have (ſays he) examined my memorandums, concerning the obſervations I made on the eondenſed air in the air vault of the Devon iron works, near Alloa, on the north ſide of the frith of Forth; and, aeeording to your requeſt, I now tranſmit you an account of them; and alſo of an experiment I made, when a partner and manager of theſe works, in order to increaſe the produce of blaſt furnaces.

The two blaſt furnaees at Devon are of large dimenſions, each being 44 feet high, and about 13 feet wide in the boſhes, or wideſt part, and are formed on a ſteep bank, by two pits ſunk in a very ſolid ſtratum of coarſe-grained freeſtone.

Theſe pits were afterwards ſhaped and lined in the uſual manner of blaſt furnaces, with eommon bricks and fire brieks, and the hearth was laid with large blocks of the ſtone that had been dug out, and which ſerve the purpoſe of fire ſtones. At the back of the two furnaces, next the bank, the air vault is excavated, and formed by a mine driven in the ſolid rock, diſtant from the furnaees about 16 feet. The bottom of the air vault is only about four feet higher than the level of the bottom of the furnaces. This vault has an aperture at one end to receive the air from the blowing machine, and has two at the oppoſite end, one of whieh receives the eduction pipe, and the other is a door to give admittance oceaſionally into the vault. As the rock is extremely cloſe and ſolid, the vault is dry, exeept that a little water oozes very gently from the ſide next the bank in ſmall drops, and does not appear to exceed an Engliſh pint in 24 hours.

Theſe furnaces are provided with air, or blaſt, as it is termed, by the means of a fire-engine of the old, or Newcomen's conſtruction. The diameter of the ſteam cylinder is $48\frac{1}{4}$ inehes; and the ſquare area of its piſton being about $1866\frac{1}{2}$ ſquare inehes, the power of this ſort of engine eannot be rated at more than 7lb. to the ſquare inch, amounting in all to about 13062lb. This power was employed to work an air pump, or blowing cylinder, of 78 inches diameter, and about ſeven feet long. The number of ſquare inches on the piſton of the air pump is 4778, and therefore this area, being multiplied by $2\frac{3}{4}$, will produce 13139, being a reſiſtanee that nearly balanees the above-rated power, and ſhows that the air, which was expelled from the air pump, could not be eondenſed more in the ordinary way

rnace. way of working, than with a compreſſing power of about 2¼lb. on each ſquare inch. As the engine was not regulated, at firſt, to make a longer ſtroke than about four feet eight inches, only one furnace being uſed, the quantity of air expelled at each ſtroke of the machine was about 155 cubic feet, which it diſcharged through a valve into the air vault, about 16 times in a minute. When two furnaces afterwards were blown, the engine was regulated to work much quicker, and with a longer ſtroke. The air vault is 72 feet long, 14 feet wide, and 13 feet high; and contains upwards of 13,000 cubic feet, or above 80 times the contents of the air pump. The top, ſides, and bottom of this vault, where the leaſt fiſſure could be diſcovered in the beds of the rock, were carefully caulked with oakum, and afterwards plaſtered, and then covered with pitch and paper. The intention of blowing into the vault is to equalize the blaſt, or render it uniform, which it effects more completely than any machinery ever yet contrived for the ſame purpoſe. The air is conducted from the vault by the eduction pipe, of 16 inches diameter, into an iron box or wind cheſt, and from this it goes off to each furnace, in two ſmaller pipes that terminate in nozles, or blow-pipes, of only 2⅛ to 3¾ inch diameter, at the tuyere of the furnace.

Dimenſions of the air vault.

Trial of the furnace faſt.

"When the furnace was put in blaſt, after having been filled with coakes, and gently heated for more than ſix weeks, the keepers allowed it to have but little blaſt at firſt, giving it a ſmall blow-pipe of about 2¼ inches diameter, and likewiſe letting off a very conſiderable quantity of air, at the eſcape or ſafety valve on the top of the iron wind cheſt, as it is a received though erroneous opinion among them, that the blaſt muſt be let on very gradually for ſeveral months. From the conſtruction of this valve, it was impoſſible to aſcertain the exact proportion of the blaſt which was thus loſt, but I believe it was very conſiderable. The conſequence was, that the furnace, after it had been in blaſt for ſeveral days, never ſeemed to arrive at its proper degree of heat, but was always black and cold about the tuyere in the hearth, and appeared in danger of choking, or gobbing as it is termed.

"After various experiments tried in vain, by the keepers and the company's engineer, and others, (indeed they tried every thing, except giving the furnace a greater quantity of air, which, as I afterwards aſcertained, was all that it wanted), they concluded, that the air vault was the cauſe of the whole miſchief; and, to confirm their opinion, they ſaid they had now diſcovered that water was, in conſiderable quantities, driven out of the air vault through the blow-pipe, which cooled the furnace; and they inſiſted, that the power of the engine was ſuch as to force water out of the ſolid rock; ſo that this method of equalizing the blaſt never would ſucceed. The other managing partner was ſo much alarmed by theſe repreſentations, that he began to conſult with the engineer, and others, about finding a ſubſtitute for the air vault at any expence.

Cauſes invеſtigated.

"As the plan of the blowing apparatus had been adopted at my recommendation, and was now ſo loudly condemned on account of the water, I had other motives, than mere intereſt, for trying to become better acquainted with the phenomena attending it. I accordingly determined to go into the air vault, and to remain incloſed in the condenſed air while the engine was blowing the furnace. It is an experiment that perhaps never was made before, as there never exiſted ſuch an opportunity. I could not perſuade the engineer, or any other of the operative people about the work, to be my companions, as they imagined that there was much danger in the experiment. Mr Neil Ryrie, however, one of the clerks of the Devon company, had ſufficient confidence in my repreſentations to venture himſelf along with me. Furnace.

"The machine had been ſtopped about two hours previous to our entering the vault, and we found a dampneſs and miſtineſs in it, which diſappeared ſoon after the door was ſhut faſt upon us, and the engine began to work in its uſual manner. After four or five ſtrokes of the engine, we both experienced a ſingular ſenſation in our ears, as if they were ſtopped by the fingers, which continued as long as we remained in the condenſed air. Our breathing was not in the leaſt affected. I had no thermometer with me, but the temperature of the air felt to us the ſame as that without the vault. Sound was much magnified, as we perceived, when we talked to each other, or ſtruck any thing; particularly, the noiſe of the air eſcaping at the blow-pipe, or waſte-valve, was very loud, and ſeemed to return back to us. There was no appearance of wind to diſturb the flame of our candles; on the contrary, I was ſurpriſed to find, that when we put one of them into the eduction pipe, which conveys the wind from the vault to the furnaces, it was not blown out. There was not the ſmalleſt appearance of any drops of water iſſuing out of this pipe. The oozing and dropping of water from the ſide of the rock, next the bank, ſeemed the ſame as before the condenſation was made in the vault. In ſhort, every thing appeared, in other reſpects, the ſame as when we were in the common atmoſphere. Having remained about an hour in the condenſed air, and ſatisfied ourſelves that no water, during that time, that we could in the leaſt diſcover, was agitated and forced out of the rock and vault by the power of the blaſt, as was imagined and inſiſted on, we gave the ſignal to ſtop the engine. As ſoon as it ceaſed to work, and the condenſation abated, and before the door of the vault was unſcrewed, the whole vault in a few ſeconds, became filled with a thick vapour, ſo that we could hardly ſee the candles at four or five yards diſtance. The door being now opened, the work people, anxious to know our ſituation, and what had occurred, came into the vault, and prevented any further obſervations. Phenomena in the air vault, and peculiar ſenſations of perſons within it.

"I now endeavoured to account for this curious appearance of the water, which only ſhowed itſelf occaſionally, in very ſmall quantities, at the tuyere, at a hole I ordered to be made in the bottom of the wind cheſt to collect it more accurately, for it never was obſerved, but either when the engine, after working ſlowly, was made to work quicker, or, after having been ſtopped for a few minutes, was ſet to work again.

"I conſidered the vapour which we had diſcovered in the vault to ariſe from the moiſture of the ſide of the rock next the furnace, which being expelled by the great heat of the furnace, and converted into vapour, was able to force its way through the pores of the rock into the vault, but that being in a manner confined within the rock, by the preſſure of the condenſed air, it found itſelf at liberty to come into the The vapour obſerved in the vault accounted for.

Furnace

vault, only when the condenſation abated conſiderably, or was totally removed by the going ſlow, or ſtopping of the engine. It alſo occurred to me, that the air, in a ſtate of condenſation, might poſſibly be capable of holding a greater quantity of water in ſolution, which might precipitate ſuddenly into vapour or miſt when the condenſation abated. I imagined, therefore, that the very ſmall quantities of water we at times diſcovered, proceeded from nothing elſe but this vapour, in its paſſage to the furnace along with the blaſt, being condenſed into water, by the coolneſs of the eduction pipe and iron wind cheſt. The quantity of water did not appear to amount to a gallon in twenty-four hours.

" A few days after I had made this experiment, the water ceaſed entirely to make its appearance, either at the tuyere, or at the hole in the wind cheſt, but the furnace did not come into heat for a long while after, and indeed not till the keepers let much more air into it by a larger blow-pipe, and allowed leſs air to eſcape at the ſafety valve. It is probable that the rock was now become perfectly dry by the continued heat of the furnace.

" My experiment had the good effect to remove all the prejudices againſt the plan I had adopted of blowing the furnaces, and likewiſe prevented the other partner from laying out a large ſum of money, by ſtopping the works, and altering the blowing machinery. Indeed, it has ſince been admitted, by all who have ſeen it at work, to be the moſt ſimple and effective method of equalizing the blaſt which has yet been put in practice.

Wind gauge applied and its effects.

" This experiment led me, ſome time afterwards, to apply a wind gauge that I contrived, to aſcertain preciſely the ſtate of the condenſation of the air thrown into the furnaces. I found that a column of quick-ſilver was raiſed five inches, and ſometimes, though ſeldom, ſix inches, and, in the interval of the engine to receive air into the air pump, it fell only half an inch. At this time only one furnace was worked. But when two furnaces were in blaſt, the engine only raiſed the mercurial gage about four inches, becauſe the Devon company, for ſeveral reaſons, did not, while I continued a partner, think proper to allow the blowing machinery to be completed, by putting to work their ſecond boiler of 20 feet diameter for the fire engine, according to my original deſign, which, by adjuſting the machinery, would have enabled us to blow two furnaces with two boilers, with as much effect, in proportion, as one furnace with one boiler. This inſtrument had the advantage of enabling the work people to diſcover the real power of their blaſt, and know the exact condition of the air valves, and the gearing of the blowing piſton; for if theſe were not tight, and in order, (although the engine might, to appearance, be doing well, by making the ſame number of diſcharges of the air pump as uſual per minute), yet the wind gage would not riſe ſo high, and would ſhew that there was an imperfection ſomewhere, by reaſon of a quantity of air eſcaping at the valves, or piſton, that could not ſo eaſily otherwiſe be known. This contrivance was conſidered as of much uſe, and was afterwards always quoted in the company's journal books, to ſhow the actual ſtate of the blowing machine, in comparing the daily produce of the furnaces.

" I hope you will not think me tedious, when I explain to you another experiment, which appears to me to be of conſiderable importance to all manufacturers of caſt iron. Furnace

" I had reaſon to conjecture, from my own obſervations on the effects of blowing machinery on blaſt furnaces, as well as from the knowledge I had acquired from my father Dr Roebuck, and from my communications with other experienced iron maſters, that a great part of the power of ſuch machinery was miſapplied in general practice, by throwing air into furnaces with much greater velocity than neceſſary, and that, if this velocity was, to a certain degree, diminiſhed, the ſame power, by properly adjuſting the blowing machinery, of whatever nature, would be capable of throwing into the furnace a proportionally greater quantity of air. For, *Since the quantities of any fluid, iſſuing through the ſame aperture, are as the ſquare roots of the preſſure;* it follows, that it would require *four* times the preſſure, or power, to expel *double* the quantity of air, through the ſame aperture, in the ſame time; but if the area of the aperture was doubled, then the quantity of air expelled by the ſame power, and in the ſame time, would be increaſed in the ratio of the ſquare root of 2 to 1, though its velocity would be diminiſhed exactly in the ſame proportion. Again: I conſidered that the quantity and intenſity of heat, produced in blaſt furnaces, and conſequently its effects in increaſing the produce, might be only in proportion to the quantity of air decompoſed in the proceſs of combuſtion, without regard to its greater velocity; that is to ſay, whether or not the ſame quantity of air was forced, in the ſame time, into the furnace through a ſmall pipe, or through one of larger dimenſions; for, in attending to the proceſs of a common air furnace for remelting of iron, where there is a very large quantity of air admitted through the large areas between the bars, it is well known, that a much greater intenſity of heat is produced than takes place in a blaſt furnace; and yet the air does not enter into the fire through the bars with increaſed denſity or great velocity. I therefore thought it probable, that increaſing the *quantity* of air thrown into the blaſt furnace in a conſiderable degree, although the *velocity* or *denſity* might be much leſs, would have the effect of increaſing its heat, and operations, and produce. And as, from the principles above ſtated, with regard to the machinery, I ſaw I could greatly increaſe the quantity of air thrown into the furnace, by enlarging the diameter of the blow-pipe, and regulating the engine accordingly, without being obliged to employ more power, I was anxious to make this experiment. The velocity of the blaſt, and its quantity conſidered,

" A ſyſtem of management, of which I did by no means approve, was adopted by the other partners of the Devon company, ſoon after the works were begun to be erected; and, in the proſecution of it, they ordered their ſecond furnace to be put in blaſt, without permitting thoſe meaſures to be taken that were neceſſary to provide and maintain a ſufficient ſtock of materials; and alſo without allowing their blowing machine to be completed, according to the original deſign, by the addition of its ſecond boiler. As might have been expected, a trial of ſeveral months to carry on two furnaces, with only half the power of ſteam that was neceſſary, and an inadequate ſtock of materials, proving unſucceſsful,

Furnace. unſucceſsful, the company, as a remedy, inſtead of making up the above deficiencies, ordered one of the furnaces to be blown out, and ſtopped altogether. This improper meaſure, however, afforded me the opportunity of immediately putting in practice the plan I have mentioned.

" When one of the furnaces was ſtopped, the other continued to be blown by a blow-pipe of $2\frac{1}{4}$ inches diameter, and the produce of the furnace, for ſeveral weeks thereafter, was not 20 tons of iron per week at an average. The engine at this time was making about 16 ſtrokes a minute, with a ſtroke of the air pump, about 4 feet 8 inches long; but when I altered the diameter of the blow-pipe, firſt to 3, and immediately after to $3\frac{1}{4}$ inches diameter, and regulated the working gears of the engine, ſo as to make a ſtroke of 5 feet 2 inches long, and about 19 ſtrokes in a minute, on an average, the produce was immediately increaſed. It continued to be, on an average of nine months immediately after this improvement, at the rate of 33 tons of iron per week, of as good quality as formerly; for, during this period, from the 21ſt November 1795 to July 30, 1796, this one furnace yielded 1188 tons of iron. No more coals were conſumed in working the blaſt engine, or other expences about the blowing machine incurred, and therefore no more power was employed to produce this great effect. It is alſo of much importance to remark, that the conſumption of materials, from which this large produce was obtained, was by no means ſo great as formerly. The furnace required very conſiderably *leſs fuel, leſs iron ſtone, and leſs limeſtone*, than were employed to produce the ſame quantity of iron by the former method of blowing; and according to the ſtatements made out by the company's orders, as great a change was effected in the economical part of the buſineſs.

" From the ſucceſs of this experiment, ſo well authenticated, and continued for ſeveral months, I am led to be of opinion, that all blaſt furnaces, by a proper adjuſtment of ſuch machinery as they are provided with, might greatly and advantageouſly increaſe their produce, by aſſuming this as a principle, viz. ' *That with the given power it is rather by a great quantity of air thrown into the furnace, with a moderate velocity, than by a leſs quantity thrown in with a greater velocity, that the greateſt benefit is derived, in the ſmelting of iron ſtones, in order to produce pig-iron.*' However, it is by experiment alone, perhaps, that we can be enabled to find out the exact relations of power, velocity, and quantity of air requiſite to produce a *maximum* of effect (1)." Furnace.

In order to illuſtrate what is ſaid above, a ground plan of the air vault and furnaces of the Devon Iron Works is given in Plate CCXXVI.; of which the explanation follows.

Explanation of Fig. 11.

A, The air vault, formed by a mine driven in the ſolid rock of coarſe-grained freeſtone. Fig. 11.

B, The blowing cylinder.

C, The pipe that conveys the air from the blowing cylinder to the air vault.

D, The eduction pipe that carries the air from the air vault to the iron wind-cheſt.

E, The iron wind cheſt (about $2\frac{1}{2}$ feet cube), in which is inſerted a wind-gauge, repreſented in fig. 12.

FF, The two blow-pipes for each furnace, which terminate in apertures of $3\frac{1}{4}$ inches diameter at the tuyeres of the furnaces.

GG, The two blaſt furnaces, placed in two pits ſunk in the ſolid rock.

HH, The tymps of the furnaces from whence the caſt iron is run off into the caſting room, LL.

O, The door to give occaſional admittance into the air vault.

M, The excavation, in which is placed the blowing machine.

Explanation of Fig. 12.

A, The end of the wind-gauge (about 12 inches long), which is open to the atmoſphere, being half filled with quickſilver. Fig. 12.

B, The end that is inſerted in the iron wind cheſt, and expoſed to the preſſure of the condenſed air of the air vault.

To Mr Muſhet we are alſo indebted for the following account of air furnaces, which are employed in iron founderies for the purpoſe of caſting large pieces of ordnance, and other heavy articles. Deſcription of an air furnace.

Theſe furnaces, he obſerves, " are employed for melting pig iron with the flame of pit coal. Furnaces of this kind are conſtructed of various ſizes according to circumſtances. The ſmall ſizes will run down from

(1) " If Q be the quantity of a fluid, iſſuing in a given time through an aperture of the diameter D, V its velocity, and P the power by which it is forced through the aperture: then the area of that aperture being as D^2, the quantity of the fluid iſſuing in the given time will be as VD^2, or $VD^2=Q$.

" Again, this quantity multiplied into its velocity, will be as the *momentum* of the fluid expelled, or as the power by which it is expelled, that is, $V^2D^2=P$, or $VD=\sqrt{P}$.

" Here, therefore, if D is given, V is as $\sqrt{P}$, as Mr Roebuck affirms. Alſo, becauſe $V=\frac{Q}{D^2}$, and alſo $V=\frac{\sqrt{P}}{D}$, $Q=D\sqrt{P}$, ſo that, while P remains the ſame, Q will increaſe as D increaſes, and V will diminiſh in the ſame ratio.

" The problem, therefore, of throwing the greateſt quantity of air into the furnace, with a given power, ſtrictly ſpeaking, has no *maximum*, but the largeſt aperture of which the engine can admit muſt be the beſt. It is probable, however, that there is a certain velocity with which the air ought to enter into the furnace; this will produce a limitation of the problem, which, as Mr Roebuck ſuggeſts, is not likely to be diſcovered but by experiment." *Note by Mr Playfair.*

Furnace. seven to ten hundred weight, and are uſed in ſmall founderies for what the trade call *jobbing*.

Plate CCXXVI. fig. 13. "Fig. 13. (Plate CCXXVI.) a ground plan of two large air furnaces, and chimney for melting pig or caſt iron with the flame of pit coal.

"The letters ABCD point out the exterior dimenſions of the ſtalk or chimney, which is firſt erected, leaving two openings or arches into which the fore-part of the furnaces are afterwards built. The breadth of the chimney at the particular place which the plan exhibits is 16 feet from A to B, and from A to D or from B to C ſix feet ſix inches. The plan is drawn at that elevation where the flame enters the chimney by the flue or throat, narrowed on purpoſe to throw back part of the flame, and keep the furnace equally hot throughout, as may be more particularly viewed in the vertical ſection, fig. 14.

"EE, the furnace bars on which the coals reſt, and where the combuſtion is maintained.

"FF, openings called teaſing holes, by which the coals are introduced to repair the fire.

"GG, fire brick buildings called bridges. Theſe are meant to concentrate the flame, that it may act as violently on the metal as poſſible. Upon the height of the bridge much depends in fuſing the metal ſpeedily, and with little loſs. The height of this may be ſeen in the vertical ſection, fig. 14. G.

"HH, the charging doors, by which the metal is introduced in the ſhape and ſtate of pig iron, lumps, ſcraps, &c. &c. The iron generally occupies the furnace acroſs to I, called the back wall, and is never meant to approach the bridge nearer than the dotted line, leſt the metal in melting ſhould run back into the grates, in place of deſcending into the general reſervoir or cavity below. The corners or notches, *h*,*h*,*h*,*h*, receive a ſtout caſt iron frame lined with fire bricks. This is hung by means of a chain and pulley, and can be raiſed and depreſſed at pleaſure. This frame is, properly ſpeaking, the charging door, and is always carefully made air tight by means of moiſtened ſand.

"KK, the flues or openings by which the flame enters the chimney. Theſe are 15 inches by 10. On maintaining theſe openings of a proportionate ſize to the other parts depend in a great meaſure the powers and economy of the furnace.

"LL, lading doors, by which ladles are introduced, in the caſe of ſmall furnaces, to lift out the metal and diſtribute it to the various moulds.

"MMMM, binding bolts to limit within proper bounds the expanſion which takes place in the building when the furnace is highly heated.

Fig. 14. "Fig. 14. vertical ſection of one of the furnaces, and its appropriate ſtalk or chimney.

"E, the grates.
"F, the teaſing hole.
"G, the bridge.
"H, the charging door.
"K, the flue or opening into the chimney.
"L, the lading door.
"MM, the binder or binding bolt.
"N, the interior of the ſtalk or chimney, 30 inches ſquare.
"OO, the fire brick work, nine inches thick.
"PP, ſpace of two inches for ſtuffing with ſand.
"QQ, common brick building.

"RR, caſt iron lintels, over which are thrown double nine inch arches, ſo that at any time the inferior building can be taken down to make repairs, without ſhaking or in the leaſt injuring the chimney. Furnace.

"S, The dotted lines here are meant to repreſent what is called the tapping hole. When a large piece of goods is to be caſt, lifting the metal with ladles would be impracticable. A ſharp pointed bar is driven up this opening. The iron then flows freely out into a large baſon of ſand made for its reception. It is then conducted, by collateral channels, into the mould.

"The ſpace under the curved dotted lines from G to L, by S, is filled with a mixture of ſand and aſhes. When the ſurface is prepared to melt, the whole of the bottom receives a ſtratum of ſharp clean ſand about two inches thick. This is broken up at night, and freſh ſand is ſubſtituted for it before the fire is kindled in the morning.

Fig. 15. "Fig. 15. is a horizontal ſection of the chimney or ſtalk, taken where the flues aſſume a perpendicular direction. The letters in this figure correſpond to thoſe in the vertical ſection, fig. 14. The height of the chimney ought not to be leſs than 45 feet: if 50 feet, the effect will be ſooner and of courſe better produced.

"The effect wiſhed to be produced in air furnaces is the fuſion of a certain portion of pig or caſt iron, for the purpoſe of being poured or run into moulds to form articles of almoſt every deſcription.

Preparation of the furnace. "The preparation previous to melting is as follows: After the bottom of the furnace is laid, and ſmoothed with freſh ſand, and all the openings made air tight, the furnace man introduces a kindling at the teaſing hole, accompanied with new pit coal. In a few minutes a conſiderable volume of dark flame mixed with ſmoke is produced. The fire quickly gathers ſtrength; more coal is introduced; and the furnace now becomes filled with a yellow-coloured flame. By continuing this operation for an hour, or an hour and a quarter, the furnace and flame will have become completely white; the latter ſteady, and at times apparently without motion. The furnace man now judges the bottom to have been ſufficiently hardened for receiving the pig iron without any riſk of ſinking. The charging door is now opened, and the pig metal thrown carefully and regularly upon that part of the bottom formerly deſcribed as being appropriated for its reception. The door is again cloſed and made air tight, and the operation of firing continued with unremitting care and attention.

"The time of melting depends entirely upon the quantity of metal introduced. The furnaces deſcribed above are capable of melting from 50 to 60 hundred weight of metal each, and when there is a moderate circulation of air they will perform this work in $2\frac{1}{2}$ or 3 hours. In half an hour after the metal is introduced it aſſumes a blackiſh red colour. It then begins to brighten with every additional fire, and in about one hour appears white, and begins to loſe ſhape, and reſemble a wreath of ſnow.

"An eye accuſtomed to ſuch heats will now diſcern the metal beginning to drop, and run down the inclined plane in very beautiful ſtreamlets reſembling quickſilver. Eight or ten of theſe are viſible at a time, and after proceeding half way down begin to form junctions with

with each other, and flow connected into the general cavity or reservoir. By-and-by this becomes filled, and literally forms a beautiful molten mirror, in which sometimes part of the interior furnace is reflected. Furnace.

"The furnace man, by searching at the bridge with his fire-iron or teaser, judges when the metal is nearly all gone. Of this he is certain by looking up from the peep-hole of the lading door. If the streamlets of the running metal have ceased, then the whole is melted, and ready for running out.

"In the operation of melting, the three following circumstances ought to be particularly attended to: the thinness or hotness of the metal; the waste or loss sustained in melting; and the quantity of coals employed.

"The first is of the utmost importance, as many articles in the foundery business require the metal in a state of the greatest division; otherwise they will be found imperfect when taken from the sand, and unfit for sale. The furnace man, therefore, is always on the watch to replace the fire as it decays, and keep a large and sharp volume of flame constantly passing over the metal.

"The waste or loss of real metal is also an object of great importance. This always bears a relation to the quality of the iron, the strength and cleanness of the coals, and the judgment and attention of the melter. Strong iron is found always more difficult to fuse; this necessarily exposes it for a long period in contact with the flame. The reverse happens with metal that is more fragile, and easier broken in the pig. The length of the exposure in fusing depends on this; and other circumstances being alike, the loss or waste of metal will also be in the same ratio.

"There are, however, other facts not unworthy of notice. N° 1. pig iron, or richly carbonated metal, when run from an air furnace, will be found in point of quality little better than N° 2. or carbonated iron. This is owing to a quantity of its carbone being destroyed during the fusion. The loss in melting N° 1. iron, therefore, chiefly consists of carbone; and the deficiency of metal ought never, with a clean bottom, to exceed 1 cwt. in 20.

"Carbonated or N° 2. iron also becomes deprived of a considerable portion of its carbonaceous mixture in fusion; and when run from the air furnace is seldom better than N° 3. metal. The loss sustained in melting may be averaged at $7\frac{1}{2}$ per cent.

"N° 3. pig iron is, after melting in an air furnace, found whitish or mottled. It is seldom susceptible of the same nice degree of division as the superior qualities, and loses in fusion a much larger proportion of metal, seldom under 10 per cent. and frequently $12\frac{1}{2}$ or 15.

"The quantity of coals requisite to melt a given quantity of iron is various, as much depends upon the quality and fusibility of the metal. If the furnace goes one heat a day with N° 1. or 2. iron, the quantity of coals will be from 20 to 25 cwt. for a ton of iron. If two or three heats a day, or as many tons of iron are melted at one kindling, the proportion of coals will be nearly weight for weight of the iron melted when the coals are mixed with a fair proportion of small: with strong large splint coals, one ton of good pig iron may be completely reduced with from 12 to 15 cwt. including the previous heating of the furnace *."

* *Phil. Mag.* xv. 245.

In the reduction and fusion of ores, the improvement of the blowing apparatus, or the machinery contrived for the purpose of forcing a current of air into furnaces, where a high degree of temperature was necessary, has always been an important object of consideration to the manufacturer; and indeed, it appears that the history and improvement of this kind of machinery have progressively advanced, in some cases have exceeded the improvement of other departments of the manufactures of this country. Importance of blowing machinery.

In smelting some metallic ores, as for instance, those of lead and tin, the magnitude and powers of blowing machines have been less attended to, because the requisite temperature for that purpose is far inferior to what is necessary for the reduction of the ores of iron. Lead and tin being naturally fusible, and easily volatilized in a temperature beyond a bright red heat, have hitherto fixed the limits with regard to the size of the furnace, and the quantity of blast. The air furnace is generally employed in the manufacture of copper, excepting in small blast furnaces, in which the precipitated oxide of this metal is received, and they are similar to the furnaces called cupolas, and used at iron founderies.

The lead mill, as it is called, or machine for the reduction of the ores of lead, is of a very simple construction. In the middle of a square building a water wheel is erected, and to the shaft of this wheel, four small wheels of cast iron, about 18 inches in diameter, are attached. Two pairs of bellows placed at equal distances, and on each side of the shaft, are supported on a strong frame of wood. During the revolution of the shaft of the water wheel, the small wheels are also carried round, and alternately depress the end of the lever which is attached by means of an iron chain, to an equally balanced beam. When this lever descends, the opposite end of the beam is elevated, and to this end there is attached by another iron chain, the moveable surface of the bellows. The blast produced in this way is soft, and far inferior, either with regard to quantity or density, to the blast necessary for an iron furnace. The length of the bellows is usually about 10 feet, the breadth across the breech about five or six, and they move at the rate of about 30 strokes a minute.

But in the manufacture of iron, and particularly since the use of pit-coal was introduced, it is absolutely necessary to have a more powerful blowing machinery. This, therefore, has always been an essential requisite, and has been a constant object in this manufacture; for in proportion to the quantity of air thrown into the furnace, the produce and quantity of metal is increased. In the earlier periods of this manufacture, when the fuel employed was charcoal from wood, the process was more easily managed. Furnaces which were built of small size, and which were then called *bloomeries*, were considered of sufficient capacity to yield profit, if they produced a bloom or two of iron in the day, each bloom amounting to about 90 or 120 lbs. For smaller operations, hand-bellows, and what were called fuel blasts, were deemed of sufficient power; but when the refining furnace began to be employed, and the iron manufacture branched out into the making of pig iron, and the refining which must be of great power in the manufacture of iron.

Furnace. refining of it into bar or malleable iron, the advantage and neceſſity of a powerful blaſt were immediately ſeen. The firſt moving power introduced was that of the water wheel; and this working two or more pairs of leathern bellows, was found to produce effects ſufficiently powerful for the purpoſe.

Progreſſive improvement of

Machinery conſtructed in this way, and ſet in motion by the power of water, continued to be employed for this purpoſe, till the principles of the ſteam engine were fully underſtood, and this powerful machine came into general uſe. The ſteam engine, beſides many other advantages, could be employed in ſituations where the want of water prevented furnaces being erected, but otherwiſe commodious, in being near the neceſſary materials of ore and fuel. The firſt ſubſtitute for the leathern bellows were cylinders compoſed of wood, cloſely jointed, and ſtrongly hooped. Theſe in their turn gave place to cylinders of caſt iron, ſmoothly and accurately bored; and this kind of apparatus being diſcovered and applied in the manufacture of iron, the blowing machine now aſſumed a more perfect and more manageable form.

But without attempting to deſcribe any of the blowing machines in our own country, the power and effects of which are familiar to thoſe to whom this knowledge is moſt intereſting, we ſhall give a ſhort deſcription of an apparatus of this kind, which is ſet in motion by the preſſure of a column of water, and is erected near Namur in the Netherlands. The account of this machine is given by Baillet, inſpector of the mines, who obſerves, that its conſtruction is ſimple, and not very expenſive, and that it may be kept up without requiring much repair. This machine, beſides, can be employed to blow ſeveral furnaces at once. It does not require any great moving power, and the conſumption of water is much leſs than in the blowing apparatus of leather or wood. In conſequence of theſe advantages, the number of furnaces has been greatly increaſed ſince this apparatus was firſt erected, and the extent of the manufacture has been doubled. This apparatus poſſeſſes another ſuperiority over the ordinary blowing machines. The latter, to be put in motion, require a water wheel; but the apparatus which is here alluded to, is ſet in motion merely by the preſſure of a column of water.

blowing machine by the preſſure of water.

The following is the deſcription of this blowing machine, as it was firſt erected at Marche upon the Meuſe. It was invented and conſtructed by Janniens, proprietor of the forges, and it conſiſts of two cylinders of three feet eight inches diameter, and of thirty inches high, placed vertically near each other. One of theſe cylinders is repreſented at fig. 16. A piſton of wood covered with leather, (fig. 17.) moves in each cylinder, and forces the air through the tubes *o*, *o*, *o*, which are fitted to the upper part of the cylinders, and are conducted to the different furnaces where combuſtion is to be excited. The baſe of theſe tubes is furniſhed with valves, to prevent the return of the air. The piſton is, beſides, furniſhed with two lids or covers, *w*, *w*, (fig. 18. and 19.) which open when it deſcends, and ſhut when it riſes. The piſton is ſurrounded with a band of leather in the uſual way, to make it tight.

Fig. 16. Fig. 17.

Fig. 18. and 19.

The moving power in this apparatus, is a water wheel erected on the horizontal ſhaft, *s*. On this ſhaft are fixed the arms *t*, *t*, projecting from its circumference, which alternately elevate the ſtalk of the piſton. The deſcent of the piſton is regulated by the weight *f*, which acts as a counterpoiſe; and the ſpring of wood, *g*, which is balanced when the ſtalks of the piſton are at their loweſt deſcent, ſerves to retard the velocity, and to prevent any ſudden or violent ſtroke. Furnace.

Two of theſe cylinders, erected at one of the forges at Marche, furniſh air to two furnaces, which employ charcoal from wood, and one with coke from pit-coal. The ſtroke of the piſton is about 18 inches, and 25 ſtrokes in a minute, and with this length of ſtroke and velocity, the two piſtons produce nearly about 400 cubical feet of air. The conſumption of water, having a fall of about 10 feet, is about 80 cubical feet.

Two ſimilar cylinders, erected at another furnace at the ſame place, move with the velocity of 19 ſtrokes per minute. The length of each ſtroke is about 22 inches, ſo that it produces about 360 cubical feet of air. For this, with a fall of 10 feet, 75 cubical feet of water are neceſſary.

In the conſtruction of this blowing machine, no peculiar difficulty occurs. It is not neceſſary that the cylinders ſhould be accurately turned in the inſide. All that is required is, to grind or poliſh their inner ſurface with ſand ſtone. It was in this way that the cylinders and apparatus, juſt deſcribed, were prepared.

The piſton, which is made of wood, has in the middle of it a mortoiſe, *u*, fig. 17. and 19. to admit the ſtalk, *p*, which is kept in its place by four bands or ſtraps of iron, *x*, fig. 17.

The band of leather, *z*, is about three lines in thickneſs, and about five inches broad. It is nailed to the piſton, and ought to be raiſed above the groove or gutter, *v*.

The grooves *y*, *y*, are ſunk in the piſton, in proportion to the thickneſs of the leather, and their external diameter ſhould be ſomewhat ſmaller than that of the cylinder. The large lids or covers of the piſton are of wood, lined with ſheep-ſkin; and their hinges, which are made of leather, are fixed with ſcrews to the wood: a bridle of leather limits the extent of the opening.

The ſmall valves, which are fixed at the upper opening of the cylinders, at the end of the tubes for conducting the air, are alſo of wood, and covered with ſheep-ſkin.

The tubes or pipes which conduct the air are made of iron plates, or of tinned iron, and they terminate in pipes of a convenient diameter, and proportioned to the different furnaces. They ſhould alſo be furniſhed with keys or cocks, for regulating at pleaſure the quantity of the air.

The frame which ſupports theſe cylinders is of a very ſimple conſtruction, as will appear by inſpecting fig. 16. It is attached and ſecured to part of the wall of the building.

All that is neceſſary to keep this apparatus in order, is with a bruſh to cover the internal ſurface of the cylinders with oil once every 10 days.

The following are the dimenſions of the principal parts in the old French meaſure.

The large valves of the piſton, 8 inches by 6.
The interval between theſe valves, 14 inches.
Stalk of the piſton, 6 inches ſquare.
The rollers on the axis of the wheel { Length, 12 inches. Diameter, 36 inches.

Diameter

Furnace. Diameter of the cylinder, 38 inches.
Height of ditto, 26 do.

Baillet, who has given the above deſcription, propoſes a new application of the moving force to this kind of blowing machine; and he obſerves, that a very important advantage may be derived from theſe cylinders, ſince the ſimple preſſure of a column of water may be ſubſtituted for the moving power. In fig. 20. the apparatus is ſo arranged as to ſhew in what way this effect may be produced.

Fig. 20.

The ſtalk, *f*, of the cylindrical apparatus *c*, is common to the piſton of the ſmall cylinder *d*, in which it can convey the column of water *b c*. When the cock *h*, is open, and that at *l* is ſhut, the preſſure of the column muſt elevate the ſtalk *f*, and the piſton of the blowing cylinder. Then the cock *h* being ſhut, and that at *l* being open, the water of the cylinder *d* will flow out, and the ſtalk *f* and the piſton of the cylinder will deſcend. Theſe alternate motions can be eaſily managed by means of levers, or regulators at *i*, fitted to the ſtem of the piſton, and in the ſame way as in the ſteam engine. The openings at *h* and *l* may be regulated according to the velocity which is required in the motion of the piſton, and the diameter of the cylinder *d* will be proportioned to the fall of water *b*, *c*, and the volume of air which is wanted.

Explanation of the Figures.

Fig. 16. exhibits a ſection and elevation of the blowing machine.

a, the wall of the building. *b*, the opening in the wall for the balance beam.

c, one of the two beams which receive the gudgeons on which the balance beam moves. *d*, *e*, the balance beam; *f*, the weight which acts as a counterpoiſe; *g*, the ſpring of wood.

h, a brace or ſtrap of leather, which is attached to the curved head of the beam.

i, *k*, *l*, *m*, the frame which ſupports the cylinders.

n, the blowing cylinder of caſt iron.

o, *o*, *o*, tubes for conveying air to the furnace.

p, ſtalk of the piſton.

q, a knee or catch attached to the ſtalk.

r, the horizontal axis of the water wheel.

s, *s*, arms attached to the axis, with rollers which raiſe the knee or catch *q*, and the piſton.

t, *t*, ſimilar arms and rollers for moving the piſton of the ſecond cylinder.

Fig. 17. Section of the piſton.

Fig. 18. The piſton ſeen from above.

Fig. 19. View of the under ſurface of the piſton.

Fig. 17. 18. and 19.

p, ſtalk of the piſton.

w, *w*, lids or valves.

v, *v*, groove in the circumference of the piſton.

u, mortiſe to receive the ſtalk *p*.

x, *x*, ſtraps of iron to ſupport the ſtalk *p*.

y, *y*, the band of leather ſurrounding the piſton.

Fig. 20. *a*, a reſervoir of water; *b*, *c*, a column of water.

d, a cylinder for water. Furnace.

e, the blowing cylinder.

f, the ſtalk common to the piſtons of the two cylinders, *d* and *e*.

g, the pipe for conducting the air.

h, *l*, cocks for receiving and letting out the water.

i, *i*, the regulators, for the purpoſe of opening and ſhutting the cocks.

k, a ſecond blowing cylinder *. * *Jour. de Mines.*

The following is a deſcription by Torelli-Narci, of a three-blaſt furnace, which was conſtructed in the chemical laboratory of the French ſchool of mines. Three-blaſt furnace.

"This furnace (ſays the author) is deſtined for fuſing different mineral ſubſtances, in order to aſcertain the nature of them; and the experience of ſix years has ſhown that it anſwers the intended purpoſe. By its means a very intenſe heat is obtained, and it was employed by C. Clouet for repeating his experiments on the converſion of forged iron into caſt ſteel, which were attended with full ſucceſs.

"Chemiſts who have ſeen this furnace ſeemed deſirous of being better acquainted with the conſtruction of it: the council even tranſmitted drawings of it to ſeveral perſons; and what has hitherto prevented a deſcription of it from being given was a deſire to aſcertain its power by longer uſe.

"I long ago conceived the idea of a fuſing furnace, in which the wind was diſtributed in three tuyeres placed in its circumference, and at equal diſtances from each other; but I had no opportunity of realizing this idea till I became attached to the council of mines.

"Nearly ſeven years ago a plan was in agitation for conſtructing in the laboratory of the ſchool a fuſing furnace capable of producing a very great degree of heat, in order to operate with facility and ſpeed on larger quantities of mineral, and conſequently to obtain more preciſion in the trials which might be made than had been obtained by the ſmall furnaces before employed for docimaſtic experiments.

"I propoſed my ideas: they were approved by the council of mines; and I was ordered to cauſe the furnace I am about to deſcribe to be conſtructed. The principal difference between it and thoſe before uſed for the ſame purpoſe is, that in the preſent one the wind is introduced through three tuyeres, placed at equal diſtances from each other in its circumference, whereas in common furnaces it enters only by one.

"This furnace is round, both outſide and inſide, and conſtructed of very refractory bricks, ſecured by iron hoops in ſuch a manner that they cannot be diſplaced. It reſts on a ſquare baſe of ſtrong maſon work, raiſed to a ſufficient height above the ground to render it eaſy to manage.

"The bellows are four feet in length, and the mean breadth of them is about 20 or 21 inches: they are of wood, and the joints are covered with white leather. The upper part conſiſts of five folds and two half folds; the inferior, of two folds and two half folds. They are placed eight or nine feet (K) above a wooden box, the joints of which are covered with leather, and into which the wind

(K) "This height is arbitrary; it depends in part on the manner in which the bellows are diſpoſed, and on the height of the chamber in which the furnace is placed."

Furnace. wind as it comes from the bellows is conveyed by a copper pipe, three inches in diameter, adjuſted to the upper part of the box. The box itſelf is ſupported by two iron bars built into the wall. From the lower part of this box deſcend, in a vertical direction, three pipes of copper, two inches in diameter, bent at right angles about 45 inches below it, to bring them into a horizontal poſition, and to convey the wind to the furnace, which is about ſix feet diſtant. The extremities of theſe pipes are fitted into three tuyeres of forged iron, fixed at equal diſtances around the circumference of the furnace: theſe three pipes are more or leſs curved or bent, to convey the wind into the furnace by the three apertures made for that purpoſe.

"About ſix inches below the box is adjuſted, on each of the three tubes, which deſcend in a vertical direction, a braſs cock about three inches of interior diameter: theſe cocks ſerve to intercept entirely the communication between the bellows and the furnace; and by opening them all more or leſs, or each of them ſeparately, any required quantity of wind may be obtained (L).

"Theſe cocks are well fixed to the tubes, and kept in their place by two clips of iron ſuited to the diameters of the tubes, and forming a kind of three collars, which by means of four ſcrews embrace and confine them: theſe pieces of iron are themſelves made faſt to two crutches of iron, which ſupport the box and are fixed to it by ſcrews. The box is kept on the crutches by two ſtraps, which embrace it at each extremity, and are fixed by female ſcrews, which are fitted to ſcrews on the ends of theſe ſtraps after they have paſſed through the horizontal part of the two crutches.

"To give the proper ſtrength to this furnace, a ſolid ſquare was conſtructed of maſon-work, about a foot larger on each ſide than the exterior diameter of the ſides of the furnace, which were from 21 to 22 inches from outſide to outſide. Bricks were placed on the ground in the middle of this erection for the extent of 18 inches, in order to form a bottom, and on this baſe were placed the ſides of the furnace conſtructed in the manner about to be deſcribed.

"I cauſed to be forged two iron hoops ſix lines in thickneſs, from 2 to 2½ inches in breadth, and about 22 inches of exterior diameter: theſe two circles were faſtened together by three bars of iron, the diſtance of their exterior edge being kept at about nine inches, the height of the bricks: theſe bars are pierced with holes towards the end rivetted on the circles, and placed at equal diſtances on their circumference. One of the extremes of each of theſe three bars is left of a ſufficient length to paſs beyond the lower circle about an inch, in order to make them enter into three holes formed in the brick-work which forms the bottom of the furnace, and by theſe means to prevent the furnace from becoming deranged. Furnace.

"This kind of iron frame was filled with bricks ſimilar to thoſe employed for the bottom of the furnace: they were rubbed one on the other to ſmooth them, and the corners were a little rounded; ſo that, being placed upright with their broad ſides applied to the iron hoops, the narrow ſide ſtood inwards. By theſe means all theſe bricks were adjuſted in ſuch a manner as to touch each other by their broadeſt faces, and to form the ſides of the furnace, the thickneſs of which was equal to the breadth of the bricks, and its depth to their length. Three apertures were reſerved for the tuyeres which terminate the three tubes that convey the wind, by cutting from as many bricks a portion equal to the thickneſs of a brick.

"Theſe bricks thus adjuſted were taken from the iron frame, and then replaced, putting between them a cement to connect them firmly and to fill up the joints. The duſt produced by cutting the bricks was reſerved for this purpoſe; and I deſired the workmen to mix with it a ſmall quantity of clay diluted in a great deal of water, in order to make a puddle for daubing over the bricks, and in particular to put between them no more than was neceſſary for filling the joints and the ſmall ſpace left between their faces in conſequence of any inequality left in dreſſing them.

"The furnace thus conſtructed was then placed on its baſe, a ſtratum of the ſame mortar employed for filling up the joinings of the bricks being firſt interpoſed. The extremities of the three iron bars projecting beyond the lower circle were placed in the holes left in the baſe to receive them. The body of the furnace encircled with iron, both by its weight and the gentle blows given to the iron hoops above the bars which connected them, expelled the exceſs of the mortar, and cauſed a part of it to enter and unite with that which filled up the joints of the brick work of the circumference, which rendered it immoveable.

"The bellows is ſecured as uſual by crutches of iron and ſupporters fixed in the wall and to the floor: the handle is diſpoſed in ſuch a manner, that the rope which makes it act may be pulled by the ſame perſon who manages the fire of the furnace, which in certain caſes is neceſſary.

"The tuyeres of forged iron which receive the ends of the copper tubes are ſecured in their proper apertures in the circumference of the furnace by pieces of brick and mortar ſimilar to that employed for filling up the joints; and the ends of the copper pipes introduced into theſe tuyeres are luted with the ſame mortar, a little thickened with brick duſt.

"The apertures of theſe tuyeres towards the interior of the furnace is only nine lines in diameter; on which account,

(L) "Care muſt be taken, when the action of the bellows ceaſes, to ſhut the cocks, eſpecially when coals are uſed in the furnace; for the hydrogen diſengaged from that mineral ſubſtance aſcends into the box, and when the bellows are again made to act, may inflame, and cauſe a violent exploſion, or even burſt the bellows. This accident once took place in the furnace here deſcribed: the box burſt with a loud noiſe on the firſt ſtroke of the bellows, the gas which filled them having ſuddenly inflamed; but by good fortune no perſon was hurt. The ſame thing happened at the houſe of C. Gorlier, lockſmith of Paris; one of his bellows burſt with a horrid exploſion at the moment when they were put in motion."

Furnace. account, as the volume of air furniſhed by the bellows cannot paſs ſo quick as it is produced, it becomes condenſed in the box placed above the cocks. By theſe means a very uniform blaſt is obtained, which can alſo be regulated by opening more or fewer of the cocks.

"During more than ſix years, ſince this furnace was conſtructed, it has ſuffered no derangement: it is not even cracked. It is however worn in the inſide by the violence of the heat it has experienced, which has increaſed its diameter about two inches. The parts round the three tuyeres have alſo got hollowed, ſo that it has need of being repaired. It is intended to make it deeper, and to have a kind of moveable muffs or linings made of fire clay, in order that its diameter may be reduced at pleaſure: it is meant alſo to conſtruct it in ſuch a manner, as to depoſit the reſt or ſupport for the crucible, not on the bottom of the furnace, but on bars of forged iron placed at the diſtance of ſome inches from that bottom, ſo as to leave below them a vacuity in which the blaſt of the bellows may be diffuſed, and from which it may riſe, paſſing between the bars to traverſe the maſs of charcoal which ſurrounds the crucible. The blaſt will then produce a more uniform fire, and the flame can no longer be directed againſt the ſides of the crucibles; ſo that the riſk of their breaking by ſudden inequalities in the heat will be much leſs.

"This alteration is going to be immediately carried into execution, and the method propoſed for doing it is as follows:

"A round frame will be made of forged iron, in which bricks will be placed in the ſame manner as above deſcribed. In the lower part of the furnace an aperture will be reſerved for raking out the aſhes, which will be cloſed by means of a door of baked earth carefully luted with clay. Some inches above the bottom of the furnace will be placed a grate of forged iron, and between this grate and the bottom of the furnace the tuyeres will terminate, and the blaſt be introduced. Muffs or linings of very refractory earth will then be introduced, ſo as to deſcend to this grate. There will be two of them, one within the other, and both within the body of the furnace. At the lower part theſe muffs will be furniſhed with a rim, projecting outward ſo as to leave between the body of the furnace and the muffs a vacuity, which will be luted at the bottom with clay, and which will be filled with pounded glaſs, or any other ſubſtance a bad conductor for heat.

The interior muff, or both of them, may be removed at pleaſure to obtain a furnace of greater or leſs capacity according to the operations to be performed. It is propoſed to make the muffs wider at the top than at the bottom.

Explanation of the Figures.

"Fig. 21. Plan of the bellows and of the furnace. AB, the bellows made of wood, the folds of which are alſo of wood covered with leather on the joints. CD, the handle which ſerves for moving the bellows. E, a copper tube which conveys the wind of the bellows into the box FG, in which it is condenſed. FG, a box of wood ſerving as a reſervoir for the wind condenſed by the bellows. HI, KL, MN, three pipes adapted to the box FG, and which convey the wind into the inſide of the furnace by three tuyeres, I, L, N. OP, maſon work to ſupport the horizontal pipes. Q, the furnace properly ſo called, the former of which is circular, and which is placed on the ſquare maſon work R, S, T, U. Furnace.

"Fig. 22. Elevation of the furnace, the pipes which convey the blaſt, the cocks, the condenſing box, and the bellows. AB, the bellows mounted in their place, and ſupported by the iron-work neceſſary for ſecuring it which is fixed in the wall and to the floor. CD, the handle which ſerves for moving the bellows. E, the copper pipe which conveys the blaſt of the bellows to the box FG in which it is condenſed. At G is a hole ſhut by a large cork ſtopper, which can be opened at pleaſure. This box is ſupported by two crutches of iron *f*, *g*, and *h*, *i*, built into the wall, and on which it is fixed by two iron ſtirrups *l*, *m*. Fig. 22.

"Fig. 23. One of the crutches and its ſtirrup are ſeen repreſented ſidewiſe at *f*, *g*, *l*; the extremities, *n*, *o*, are built into the wall, and the two ends, *p*, *q*, of the iron piece which keeps the box on the horizontal traverſe of the crutch, are tapped, and receive ſcrews which make them faſt to the crutch *f*, *g*. HI, KL, MN, are three pipes which convey the wind into the interior of the furnace. Q, R, S, T, U, maſon work on which is placed the furnace Q, and which ſerves it as a bottom. OP, maſonry which ſerves to ſupport the three pipes that convey the wind to the furnace. XYZ, fig. 22. are the three cocks fixed to the three pipes which proceed from the box to convey the wind to the furnace. Fig. 23.

"In fig. 24. the dimenſions of which are double thoſe of fig. 22. may be ſeen the details of one of theſe cocks. Fig. 24.

"At *r*, *s*, *t*, the body of the cock is ſeen in front; the ſtopper being taken out ſhows at *r* and at *t* the two holes which receive the tubes that communicate either with the box or with the tuyeres. *u* Exhibits the body of the cock ſeen on one ſide; *v* the key with its aperture *x*, and its head *y*. This key, turned round more or leſs in its ſocket, ſerves to give more or leſs wind. 1, 2, 3, Iron clips which ſecure the cocks at the diſtance they ought to be from each other, and connect them at the ſame time to the iron crutches which ſupport the air-box.

"Fig. 25. a plan of theſe two clips. They are bent at the places marked 1, 2, 3, to embrace the body of the three cocks, and ſecure them in ſuch a manner that they cannot be deranged when they are opened or ſhut. Fig. 25.

"Fig. 26. and 27. repreſent the plan and ſection of the changes and additions propoſed to be made when the furnace is re-conſtructed. At I, L, and N, are ſeen the extremities of the three pipes that enter the forged iron tuyeres, and convey the wind to the interior of the furnace. *a*, *b*, and *c*, indicate the thickneſs at the upper part of each of the muffs and of the body of the furnace, between which there are two vacuities filled with pounded glaſs or ſome other bad conductor of heat. *d*, the grate on which are depoſited the reſts of baked earth deſtined to receive the crucibles. *e*, the crucible, luted and attached with clay to a reſt of baked earth (M)." Fig. 26. and 27.

(M) "The advantage ariſing in large founderies from the application of two or three tuyeres inſtead of one, is well known; but I do not believe that ſuch an arrangement was ever adopted in ſmall furnaces.

At

Furnace.

Mr Collier, in a paper communicated to the Manchester Philosophical Society, has delivered some important observations on iron and steel, with a more correct account of the process for the manufacture of the latter than has hitherto been given. To this account he has added the description of a furnace for the conversion of iron into steel. As his observations and reasonings are extremely valuable, we shall lay the whole before our readers in his own words.

Accounts of the process for making iron and steel, imperfect.

"After examining (says Mr Collier) the works of different authors who have written on the subject of making iron and steel, I am persuaded that the accounts given by them of the necessary processes and operations are extremely imperfect. Chemists have examined and described the various compound minerals containing iron with great accuracy, but have been less attentive to their reduction. This observation more particularly applies to steel, of the making of which I have not seen any correct account.

"It is singular to observe, how very imperfectly the cementation of iron has been described by men of great eminence in the science of chemistry. Citizen Fourcroy states the length of time necessary for the cementation of iron to be about twelve hours; but it is difficult to discover whether he alludes to cast or to bar steel: for he says, that short bars of iron are to be put into an earthen box with a cement, and closed up. Now steel is made from bars of iron of the usual length and thickness: but cast steel is made according to the process described by Citizen Fourcroy, with this essential difference; the operation is begun upon bar steel and not bar iron.

"Mr Nicholson is equally unfortunate in the account given in his Chemical Dictionary. He says, that the usual time required for the cementation of iron is from six to ten hours, and cautions us against continuing the cementation too long; whereas the operation, from the beginning to the end, requires sixteen days at least. In other parts of the operation he is equally defective, confounding the making of bar with that of cast steel, and not fully describing either. In speaking of the uses of steel, or rather of what constitutes its superiority, Mr Nicholoson is also deficient. He observes, that 'its most useful and advantageous property is that of becoming extremely hard when plunged into water.' He has here forgotten every thing respecting the temper and tempering of steel instruments, of which, however, he takes some notice in the same page. 'Plunging into water' requires a little explanation: for if very hot steel be immersed in cold water without great caution, it will crack, nay, sometimes break to pieces. It is, however, necessary to be done, in order to prevent the steel from growing soft, and returning to the state of malleable iron; for, were it permitted to cool in the open air, the carbone which it holds in combination would be dissipated (N).

Furnace. Process in Sheffield.

"I shall, at present, confine my remarks to the operation performed on iron in Sheffield and its neighbourhood: from whence various communications have been transmitted to me by resident friends, and where I have myself seen the operations repeatedly performed.

"The iron made in that part of Yorkshire is procured from ores found in the neighbourhood, which are of the argillaceous kind, but intermixed with a large proportion of foreign matter. These, however, are frequently combined with richer ores from Cumberland and other places. The ore is first roasted with cinders for three days in the open air, in order to expel the sulphureous or arsenical parts, and afterwards taken to the furnaces: some of which are constructed so that their internal cavity has the form of two four-sided pyramids joined base to base; but those most commonly used are of a conical form, from 40 to 50 feet high. The furnace is charged at the top with equal parts of coal cinder and lime-stone. The lime-stone acts as a flux, at the same time that it supplies a sufficient quantity of earthy matter to be converted into scoriæ, which are necessary to defend the reduced metal from calcination, when it comes near the lower part of the furnace. The fire is lighted at the bottom; and the heat is excited by means of two pair of large bellows blowing alternately. The quantity of air generally thrown into the furnace is from a thousand to twelve hundred square feet in a minute. The air passes through a pipe, the diameter of which is from two inches and a quarter, to two and three quarters, wide. The compression of air which is necessary is equal to a column of water four feet and a half high. The ore melts as it passes through the fire and is collected at the bottom, where it is maintained in a liquid state. The slag, which falls down with the fused metal, is let off, by means of an opening in the side of the furnace, at the discretion of the workmen.

for the reduction of iron ore,

"When a sufficient quantity of regulus, or imperfectly reduced metal, is accumulated at the bottom of the furnace (which usually happens every eight hours), it is let off into moulds; to form it for the purposes intended, such as cannon or pig iron.

"Crude iron is distinguished into white, black, and gray. The white is the least reduced, and more brittle than the other two. The black is that with which a large quantity of fuel has been used; and the gray is that which has been reduced with a sufficient quantity of fuel, of which it contains a part in solution.

and for refining crude iron.

"The operation of refining crude iron consists in burning the combustible matter which it holds in solution; at the same time that the remaining iron is more perfectly reduced, and acquires a fibrous texture. For this purpose, the pigs of cast iron are taken to the forge; where they are first put into what is called the refinery: which is an open charcoal fire,

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"At Treibach, in Carinthia, C. Le Febre, and Hassenfratz member of the council and inspector of mines, saw, about twenty years ago, a large furnace with two tuyeres; drawings of which they brought to France, and which they represented in the third plate of *l'Art de fabriquer des Canons*, by Monge: two pairs of bellows supply wind through two opposite tuyeres, and since that arrangement the daily product of metal has been double."

(N) "It is the opinion of some metallurgists, that a partial abstraction of oxygen takes place, by plunging hot metal into cold water."

Furnace. fire, urged by a pair of bellows, worked by water or a ſteam engine; but the compreſſion of air, in the refinery, ought to be leſs than that in the blaſt furnace. After the metal is melted, it is let out of the fire by the workmen, to diſcharge the ſcoriæ; and then returned and ſubjected to the blaſt as before. This operation is ſometimes repeated two or three times before any appearance of malleability (or what the workmen call coming into nature) takes place; this they know by the metal's firſt aſſuming a granular appearance, the particles appearing to repel each other, or at leaſt to have no ſigns of attraction. Soon afterwards they begin to adhere, the attraction increaſes very rapidly, and it is with great difficulty that the whole is prevented from running into one maſs, which it is deſirable to avoid, it being more convenient to ſtamp ſmall pieces into thin cakes: this is done by putting the iron immediately under the forge hammer and beating it into pieces about an inch thick, which eaſily break from the reſt during the operation. Theſe ſmall pieces are then collected and piled upon circular ſtones, which are an inch thick, nine inches in diameter, and about ten inches high. They are afterwards put into a furnace, in which the fire is reverberated upon them until they are in a ſemi-fluid ſtate. The workmen then take one out of the furnace and draw it into a bar under the hammer; which being finiſhed, they apply the bar to another of the piles of ſemi-fluid metal, to which it quickly cements, is taken again to the hammer, the bar firſt drawn ſerving as a handle, and drawn down as before. The imperfections in the bars are remedied by putting them into another fire called the chafery, and again ſubjecting them to the action of the forge hammer.

"The above method is now moſt in uſe, and is called flouriſhing; but the iron made by this proceſs is in no reſpect ſuperior to that which I am going to deſcribe. It is, however, not ſo expenſive, and requires leſs labour.

"The proceſs for refining crude iron, which was moſt common previouſly to the introduction of flouriſhing, is as follows.

"The pigs of caſt iron are put into the refinery, as above, where they remain until they have acquired a conſiſtence reſembling paſte, which happens in about two hours and a half. The iron is then taken out of the refinery and laid upon a caſt iron plate on the floor, and beaten by the workmen with hand hammers, to knock off the cinders and other extraneous matters which adhere to the metal. It is afterwards taken to the forge hammer and beaten, firſt gently, till it has obtained a little tenacity; then the middle part of the piece is drawn into a bar, about half an inch thick, three inches broad, and four feet long; leaving at each end a thick ſquare lump of imperfect iron. In this form it is called ancony. It is now taken to the fire called the chafery, made of common coal; after which the two ends are drawn out into the form of the middle, and the operation is finiſhed.

"There is alſo a third method of rendering crude iron malleable, which, I think, promiſes to be abundantly more advantageous than either of the two former, as it will diſpenſe both with the refinery and chafery; and nothing more will be neceſſary than a reverberating furnace, and a furnace to give the metal a malleable heat, about the middle of the operation. The large forge hammer will alſo fall into diſrepute, but in its place muſt be ſubſtituted metal rollers of different capacities, which, like the forge hammer, muſt be worked either by a water wheel, or a ſteam engine. Furnace. An improved proceſs.

"It is by the operation of the forge hammer or metal rollers, that the iron is deprived of the remaining portion of impurity, and acquires a fibrous texture.

"The iron made by the three foregoing proceſſes is equally valuable, for by any of them the metal is rendered pure; but after thoſe different operations are finiſhed, it is the opinion of many of the moſt judicious workers in iron, that laying it in a damp place, for ſome time, improves its quality; and to this alone, ſome attribute the ſuperiority of foreign iron, more time elapſing between making and uſing the metal. To the latter part of this opinion I can by no means accede, as it is well known that the Swediſh (o) ores contain much leſs heterogeneous matters than ours, and are generally much richer, as they uſually yield about 70 per quintal of pure iron, whereas the average of ours is not more than 30 or 40 (p): add to this, that the Swediſh ores are ſmelted in wood fires, which gives the iron an additional ſuperiority.

"Iron inſtruments are caſe-hardened by heating them in a cinder or charcoal fire; but if the firſt be uſed, a quantity of old leather, or bones, muſt be burnt in the fire to ſupply the metal with carbone. The fire muſt be urged by a pair of bellows to a ſufficient degree of heat; and the whole operation is uſually completed in an hour.

"The proceſs for caſe-hardening iron, is in fact the ſame as for converting iron into ſteel, but not continued ſo long, as the ſurface only of the article is to be impregnated with carbone.

"Some attempts have been made to give caſt iron, by caſe-hardening, the texture and ductility of ſteel, but they have not been very ſucceſsful. Table and penknife blades have been made of it, and, when ground, have had a pretty good appearance; but the edges are not firm, and they ſoon loſe their poliſh. Common table knives are frequently made of this metal.

"The cementation of iron converts it into ſteel:—a ſubſtance intermediate between crude and malleable iron.

"The furnaces for making ſteel are conical buildings; about the middle of which are two troughs of brick or fire ſtone, which will hold about four tons of iron in the bar. At the bottom is a long grate for fire. Furnace making ſteel.

"A layer of charcoal duſt is put upon the bottom of

(o) "Steel is commonly made of Swediſh iron."

(p) "The iron made from the ore found in the neighbourhood of Sheffield, contains a great deal of phoſphate of iron, or ſiderite, which renders the metal brittle when cold."

Furnace. the trough; and, upon that, a layer of bar iron, and ſo on alternately until the trough is full. It is then covered over with clay to keep out the air; which, if admitted, would effectually prevent the cementation. When the fire is put into the grate, the heat paſſes round by means of flues, made at intervals, by the ſides of the trough. The fire is continued until the converſion is complete, which generally happens in about eight or ten days. There is a hole in the ſide by which the workmen draw out a bar occaſionally, to ſee how far the tranſmutation has proceeded. This they determine by the bliſters upon the ſurface of the bars. If they be not ſufficiently changed, the hole is again cloſed carefully to exclude the air; but if, on the contrary, the change be complete, the fire is extinguiſhed, and the ſteel is left to cool for about eight days more, when the proceſs for making bliſtered ſteel is finiſhed.

Bliſtered ſteel.

"For ſmall wires, the bars are drawn under the tilt hammer, to about half an inch broad and three-ſixteenths of an inch thick.

Tilted ſteel. "The change wrought on bliſtered ſteel by the tilt hammer, is nearly ſimilar to that effected on iron from the refinery by the forge hammer. It is made of a more firm texture, and drawn into convenient forms for uſe.

German ſteel. "German ſteel is made by breaking the bars of bliſtered ſteel into ſmall pieces, and then putting a number of them into a furnace; after which they are welded together and drawn to about 18 inches long; then doubled and welded again, and finally drawn to the ſize and ſhape required for uſe. This is alſo called ſhear ſteel, and is ſuperior in quality to the common tilted ſteel.

Caſt ſteel. "Caſt ſteel is alſo made from the common bliſtered ſteel. The bars are broken and put into large crucibles with a flux. The crucible is then cloſed up with a lid of the ſame ware, and placed in a wind furnace. By the introduction of a greater or ſmaller quantity of flux, the metal is made harder or ſofter. When the fuſion is complete, the metal is caſt into ingots, and then called ingot ſteel; and that which afterwards undergoes the operation of tilting, is called tilted caſt ſteel.

"The caſt ſteel is the moſt valuable, as its texture is the moſt compact and it admits of the fineſt poliſh.

"Sir T. Frankland has communicated a proceſs, in the Tranſactions of the Royal Society, for welding caſt ſteel and malleable iron together; which, he ſays, is done, by giving the iron a malleable, and the ſteel a white heat; but, from the experiments which have been made at my requeſt, it appears, that it is only ſoft caſt ſteel, little better than common ſteel, that will weld to iron: pure ſteel will not; for, at the heat deſcribed by Sir T. the beſt caſt ſteel either melts or will not bear the hammer.

"It may here be obſerved, as was mentioned before, that ſteel is an intermediate ſtate between crude and malleable iron, except in the circumſtance of its reduction being complete; for, according to the experiments of Reaumur and Bergman, ſteel contains more hydrogen gas than caſt iron, but leſs than malleable iron;—leſs plumbago than the firſt, but more than the latter;—an equal portion of manganeſe with each;—leſs ſiliceous earth than either—more iron than the firſt, but leſs than the ſecond. Its fuſibility is likewiſe intermediate, between the bar iron and the crude. When ſteel has been gradually cooled from a ſtate of ignition, it is malleable and ſoft, like bar iron; but when ignited and plunged into cold water, it has the hardneſs and brittleneſs of crude iron. Furnace.

"From the foregoing facts, we are juſtified in drawing the ſame concluſions with Reaumur and Bergman, but which have been more perfectly explained by Vandermonde, Berthollet, and Monge, that crude iron is a regulus, the reduction of which is not complete; and which conſequently will differ according as it approaches more or leſs to the metallic ſtate. Forged iron, when previouſly well refined, is the pureſt metal; for it is then the moſt malleable and the moſt ductile, its power of welding is the greateſt, and it acquires the magnetic quality ſooneſt. Steel conſiſts of iron perfectly reduced and combined with charcoal; and the various differences in bliſtered ſteel, made of the ſame metal, conſiſts of the greater or leſs proportion of charcoal imbibed.

"Iron gains by being converted into ſteel, about the hundred and eightieth part of its weight.

Hardening ſteel. "In order to harden ſteel, it muſt be put into a clean charcoal, coal, or cinder fire, blown to a ſufficient degree of heat by bellows. The workmen ſay, that neither iron nor ſteel will harden properly without a blaſt. When the fire is ſufficiently hot, the inſtrument intended to be hardened muſt be put in, and a gradual blaſt from the bellows continued until the metal has acquired a regular red heat; it is then to be carefully quenched in cold water. If the ſteel be too hot when immerſed in water, the grain will be of a rough and coarſe texture; but if of a proper degree of heat, it will be perfectly fine. Saws and ſome other articles are quenched in oil.

Tempering. "Steel is tempered by again ſubjecting it to the action of the fire. The inſtrument to be tempered we will ſuppoſe to be a razor made of caſt ſteel. Firſt rub it upon a grit ſtone until it is bright; then put the back upon the fire, and in a ſhort time the edge will become of a light ſtraw colour, whilſt the back is blue. The ſtraw colour denotes a proper temper either for a razor, graver, or penknife. Spring knives require a dark brown; ſciſſars, a light brown, or ſtraw colour; forks or table knives, a blue. The blue colour marks the proper temper for ſwords, watch-ſprings, or any thing requiring elaſticity. The ſprings for penknives are covered over with oil before they are expoſed to the fire to temper.

Explanation of the Figures.

Fig. 28. and 29. "Fig. 28. is a plan of the furnace, and fig. 29. is a ſection of it taken at the line AB. The plan is taken at the line CD. The ſame parts of the furnace are marked with the ſame letters in the plan and in the ſection. EE are the pots or troughs into which the bars of iron are laid to be converted. F is the fire-place; P, the fire bars; and R, the aſhpit. GG, &c. are the flues. HH is an arch, the inſide of the bottom of which correſponds with the line IIII, fig. 28. and the top of it is made in the form of a dome, having a hole in the centre at K, fig. 29. LD, &c. are ſix chimneys. MM is a dome, ſimilar to that of a glaſs-houſe, covering the whole. At N there is an arched opening, at which the materials are taken in and out of the furnace,

Furnace. nace, and which is closely built up when the furnace is charged. At OO there are holes in each pot, through which the ends of three or four of the bars are made to project quite out of the furnace. These are for the purpose of being drawn out occasionally to see if the iron be sufficiently converted.

"The pots are made of fire tiles, or fire stone. The bottoms of them are made of two courses, each course being about the thickness of the single course which forms the outsides of the pots. The insides of the pots are of one course, about double the thickness of the outside. The partitions of the flues are made of fire brick, which are of different thicknesses, as represented in the plan, and by dotted lines in the bottom of the pots. These are for supporting the sides and bottoms of the pots, and for directing the flame equally round them. The great object is to communicate to the whole an equal degree of heat in every part. The fuel is put in at each end of the fire-place, and the fire is made the whole length of the pots, and kept up as equally as possible."

Improved process of cupellation. In a memoir published by Du Hamel, the inconvenience and expence which attend the process commonly in use, for refining lead or separating the silver from this metal, are pointed out, and a more economical process is proposed. This process, which is known by the name of *cupellation*, is performed in a vessel called the *cupel*, which is made of the ashes of the bones of animals, or of vegetables, after separating, by means of water, the saline parts which adhere to them. But the difficulty and expence of obtaining a sufficient quantity of these materials, led him to contrive something else as a substitute, which might be less costly and more easily obtained.

For the purpose of performing the process in the way here recommended, it is not necessary to make any alteration in the general construction of the furnace. All that is required is, to have a sufficient number of canals or openings towards its base, to allow the escape of the moisture. These canals are covered with a bed of scoria, on which is raised a pavement formed of the most porous bricks, and about a brick in thickness. On this floor or area, which should be a little concave, in the same way as the ordinary cupels are formed when they are made of ashes, is placed a quantity of casting or moulding sand, slightly moistened; and if the sand has not a sufficient quantity of earth, some clay is added, to give it consistence, and the whole is carefully mixed together. This sand is beaten together, and a concave vessel is made of it, of an equal thickness in all its parts. When the bason has been uniformly beaten, it will be proper to sift over its whole surface a small quantity of wood ashes, well washed with water, and these are also beaten down with a pestle.

The cupel being thus prepared, the head of the furnace is put on, and a moderate fire is kindled and kept up for some hours, to carry off part of the moisture of the sand. The remainder is dissipated without inconvenience, by means of the canals, during the process. After it has been sufficiently dried, the head of the furnace is again taken off, and allowed to cool a little. A quantity of straw or hay is put upon the bason or cupel, to prevent any injury from the weight of the bars of lead on the sand. To avoid this still more, it is recommended to have the lead to be purified cast into the form of hemispheres, in place of bars. Furnace.

A sufficient quantity of lead being introduced into the furnace, the head is luted on with baked clay, and the fire is applied in the usual way. As soon as the lead is completely fused, the bason appears covered with the burnt straw: this is removed by means of an iron instrument, and this operation is repeated several times. When the lead begins to grow red, the action of the bellows commences, at first softly, and the blast is so directed that it may strike the centre of the cupel. To effect this more completely, a small round plate of iron is attached to the extremity and upper part of the pipe by means of a hinge, so that at each blast it is half raised, and the current of air is directed to the surface of the fused metal.

After the whole of the scum that rises has been removed, and the lead is covered with a stratum of litharge, a small gutter is made by means of a hook for the purpose, in the sand of the cupel. This is gradually and cautiously hollowed, till it is on a level with the surface of the bath, and then the litharge driven by the blast towards the anterior part of the furnace, will flow this way, and spread itself on the floor in the usual way. When the operator perceives that the litharge has been removed, he stops up the gutter with moistened ashes, till another quantity of litharge appears on the surface. He then re-opens the gutter, which is now made deeper in proportion to the diminution of the fused metal, but at the same time taking care that no part of the lead escapes, especially towards the end of the process, because then a considerable portion of silver would be carried off.

In this way the process is conducted till the separation of the silver begins to take place, observing at the same time to increase the heat as the quantity of fused metal diminishes, because then the silver is collected together; and since it is much more difficult to keep it in fusion than the small portion of lead which remains combined with it, the separation would be very imperfect, without the application of a sufficient temperature. Instead of having only one-twentieth of lead, which is the usual proportion in the common process, the quantity would be much greater, and this would render the second operation, the refining of the silver much more difficult.

Du Hamel observes, that a cupel of sand, well made, will answer for the repetition of the process several times, without renewing it at the end of each operation, as is the case with those of ashes. The only precaution to be observed is, to remove the kind of varnish of oxyde of lead which remains on the sides of the gutter by which the litharge flowed out, that the new sand with which it is to be filled up may combine easily with the old.

The length of time which the reverberatory furnace may be employed in smelting the ores of lead, and even in reducing litharge, is a proof that the oxyde of lead acts only on the surface of the cupel, and penetrates a very small thickness. After the process has been several times repeated, this crust is removed, and it is fused for the purpose of obtaining the lead. This process will be as easy as the reduction of the metal contained in the ashes of the ordinary cupels, and in much smaller quantity.

Furnace. quantity. By the new method, therefore, a greater proportion of litharge is obtained; and it may be added, that the ſand abſorbing a ſmaller quantity of oxyde of lead, it will contain alſo a ſmaller proportion of ſilver; for it is well known that the lead which is reduced from the aſhes, contains always much more than that which is produced from the reduction of litharge.

In place of ſand, argillaceous earth may be employed in the conſtruction of cupels; but it is neceſſary that this earth be well beaten together, and that this proceſs ſhould be ſeveral times repeated, for ſeveral days, without which the clay would be apt to crack, and the melted lead would flow into the crevices; an inconvenience which does not ariſe from the uſe of ſand, even although it ſhould be mixed with a little earth. And beſides, it is to be obſerved, that the cupel conſtructed of this ſubſtance, becomes too hard to allow a gutter to be eaſily made for the paſſage of the litharge. In this caſe it would be neceſſary that the place by which the oxyde is to flow out, be made up of ſand, or of aſhes.

In the formation of the baſon or cupel, which is here propoſed, it ſeems to be advantageous to employ two kinds of ſand, the one fine, like that which is uſed by the founders, the other coarſer, and free from earth. It is of the latter, the coarſe kind, that the firſt ſtratum is formed; and this, after being made of ſufficient thickneſs, is well beaten with peſtles for the purpoſe; on this the fine ſand is to be placed, containing a proper proportion of earth, and it is to be beaten together in the ſame way. Both the coarſe and the fine ſand are to be moiſtened a little, that they may adhere together, and afterwards acquire a ſufficient degree of ſolidity under the peſtles. The ſand of the inferior layer being coarſer than the other, will abſorb the moiſture from it as it evaporates, and will allow it to paſs off eaſily, by means of the canals or openings which are left for that purpoſe. This ſtratum, too, is to remain in its place, when the fine ſand of the cupel is removed, and that the ſurface of the ſtratum of coarſe ſand may not be diſturbed when the other is removed, a thin layer of aſhes may be thrown upon it, and beaten down, before the other ſtratum is laid on*.

* *Mem. de l'Inſt.* iii 306.

The French ſchool of mines appointed a commiſſion, compoſed of Haſſenfratz, Brochant, and Miché, to conſider the beſt form for the conſtruction of a furnace for burning lime-ſtone, or plaſter of Paris. After conſidering different forms of furnaces, and reaſoning on their effects, they propoſe in their report to adopt the following, which is repreſented in fig. 30. and 31.

Fig. 30. Fig. 30. is a plan of the furnace propoſed.

D, the fire-place. E, E, openings for taking out the ſubſtances which are converted into lime or plaſter.

P, half of the plan taken at the height of the line AK of fig. 31.

Q, half of the plan taken at the height of the line, XY of fig. 31.

Fig. 31. Fig. 31. exhibits a ſection of the ſame furnace.

B, C, are places which remain empty after the introduction of the ſubſtances to be expoſed to heat.

B, D, the fires.

E, the opening for the extraction of the ſubſtances after they are converted into lime or plaſter.

C, the throat or vent. Furnace.

a, *b*, openings for regulating the heat.

We ſhall now conclude this article with a ſhort account of the conſtruction and management of furnaces for chemical purpoſes.

The following is a deſcription of an eſſay or cupel- Chemical
ling furnace. 1. A hollow, quadrangular priſm, 11 furnace.
inches broad and nine inches high, is conſtructed with iron plates, and it ends at top in a hollow quadrangular pyramid, ſeven inches high; the latter terminating in an opening ſeven inches ſquare. The priſm is cloſed at bottom with another iron plate, which ſerves as a bottom.

2. Near the bottom a door three inches high and five inches broad, is opened. This leads to the aſh hole.

3. Above this door, and ſix inches from the baſis, another door is opened, of the figure of a ſegment of a circle, four inches broad at the bottom, and three inches and a half high in the middle.

4. Three iron plates are then to be faſtened to the fore-part of the furnace, the firſt of them ſhould be 11 inches long, half an inch high, and ſo faſtened with three or four rivets, that its lower edge may reſt againſt the bottom of the furnace. Between this plate and the ſide of the furnace a ſpace muſt be left, ſo wide that the ſliders of the lower door, which are made of a thicker iron plate, may move eaſily in the groove. The ſecond iron plate, which is 11 inches long, and three inches high, is faſtened parallel to the firſt, in the ſpace between the two doors. Both the upper and lower edges of this plate form grooves with the ſide of the furnace, for receiving the ſliders which ſhut the doors. The third plate of the ſame dimenſions with the firſt, is rivetted cloſe above the upper door, and forms a groove for receiving the edge of the ſliders which move that door.

5. For the purpoſe of cloſing the doors, two ſliders of iron-plates muſt be adapted to each of them. Theſe ſliders are moved in the grooves. The two ſliders belonging to the upper door have each a hole near the top; in the one there is a ſmall hole $\frac{1}{5}$ of an inch broad, $\frac{1}{2}$ inch long; and the other a ſemicircular opening one inch high and two broad. To each ſlider there is a handle attached, to lay hold of it when it is moved.

6. Five round holes, an inch diameter, are bored in the furnace, two in the back part, and two in the fore part, five inches from the bottom; but $3\frac{1}{2}$ inches from each ſide of the furnace. The fifth hole is at the height of an inch above the upper edge of the upper door.

7. The inſide of the furnace muſt be armed with iron hooks, about three inches from each other, and projecting $\frac{1}{2}$ inch. The uſe of theſe hooks is to ſecure the lute with which the furnace is to be lined.

8. A moveable, hollow, quadrangular pyramid, alſo of iron, and 3 inches high, is to be fitted to the upper opening of the furnace, 7 inches broad, and ending above in a hollow tube, 3 inches in diameter, about 2 inches high, nearly cylindrical, but converging a little at the top. This tube ſerves to ſupport a funnel for conveying the ſmoke into the chimney. This cover has two handles to lay hold of it. To ſecure the cover on the furnace, an iron plate is rivetted to the right and left of its upper edge, and turned down towards the inſide, ſo that a furrow may be made, open before

Furnace. fore and behind, for receiving the lateral edges of the cover.

9. A ſquare ledge, made of thick iron plate, is fixed at the top of the upper edge of the lower door, for ſupporting the grate and the lute, and that it may be eaſily introduced into the cavity of the furnace, it ſhould be of two pieces.

10. Iron bars are then to be fixed in the inſide of the furnace, for ſupporting the fuel. Theſe muſt be equal in length with the diameter of the furnace, about $\frac{1}{2}$ inch thick, and $\frac{1}{4}$ inch diſtant from each other. They are ſupported at their extremities by a ſquare iron ledge.

11. To prevent the diſſipation of the heat, and the deſtruction of the iron, by being repeatedly made red hot, the inſide of the furnace muſt be lined with lute, about a finger's breadth, or rather more, in thickneſs.

Coating for furnaces. For luting furnaces, Doctor Black recommended a ſimple mixture of ſand and clay. The proportions for reſiſting the violence of fire are four parts of ſand to one of clay; but when deſigned for the lining of furnaces, he uſes ſix or ſeven of ſand to one of clay, the more effectually to prevent the contraction of the latter; for it is known from experiments, that clay, when expoſed to a ſtrong heat, contracts the more in proportion to its purity. The ſand ſettles into leſs bulk when wet, and does not contract by heat, which it alſo reſiſts as well as the clay itſelf.

Beſides this outſide lining next the fire, Dr Black uſes another to be laid on next the iron of the furnace; and this conſiſts of clay mixed with a large proportion of charcoal duſt. It is more fit for containing the heat, and is put next to the iron, to the thickneſs of an inch and a half. That it may be pretty dry when firſt put in, he takes three parts by weight of the charcoal duſt, and one of the common clay, which muſt be mixed together when in dry powder, otherwiſe it is very difficult to mix them perfectly. As much water is added as will form the matter into balls; and theſe are beaten very firm and compact by means of a hammer upon the inſide of the furnace. The other lute is then ſpread over it to the thickneſs of about half an inch, and this is alſo beaten ſolid by hammering; after which it is allowed to dry ſlowly, that all cracks and fiſſures may be avoided; and after the body of the furnace is thus lined, the vent is ſcrewed on and lined in the ſame manner. It muſt then be allowed to dry for a long time; after which a fire may be kindled, and the furnace gradually heated for a day or two. The fire is then to be raiſed to the greateſt intenſity; and thus the luting acquires a hardneſs equal to that of free-ſtone, and is afterwards as laſting as any part of the furnace.

Mode of operating with this furnace. To perform an operation in this furnace, two iron bars an inch thick, and of ſufficient length to project a little beyond the holes of the furnace, are paſſed through four lower holes, which are placed before and behind, directly oppoſite to each other. Theſe bars ſupport the muffle, which is introduced through the upper opening of the furnace, and placed upon the bars, in ſuch a way that the open ſide of it may be near the inner border of the upper door. The fuel is introduced through the top of the furnace, and the beſt fuel is charcoal made of hard wood. It ſhould be reduced to ſmall pieces, that they may readily fall between the muffle and the ſides of the furnace. The muffle is to be covered with fuel, to the height of ſeveral inches. The pieces of charcoal ſhould not be too ſmall, becauſe they may fall immediately through the interſtices of the grate, or be too rapidly conſumed, and thus increaſing the quantity of aſhes, obſtruct the current of air. Furnace.

Manage-ment of the fire. As the management of the fire is of great importance, for the ſucceſs of operations in the furnace, the following directions may be attended to. To increaſe the heat to the utmoſt, the door of the aſh-hole may be left open; the ſliders of the upper door drawn towards each other, ſo as to touch in the middle, and the cover and funnel adapted to its tube, placed on the top of the furnace. The heat is ſtill farther increaſed by putting red burning coals into the open upper door. By ſhutting the upper door with the ſlider, which has a narrow oblong hole in it, the heat is diminiſhed, and it is ſtill farther diminiſhed by ſhutting the door with the other ſlider, having the ſemicircular hole. The heat is alſo diminiſhed by removing the funnel at the top of the cover; and the heat is leſs by partially or totally ſhutting the door of the aſh-hole, becauſe then the current of air neceſſary to excite combuſtion is obſtructed.

The heat of the furnace is alſo increaſed in proportion to the diminiſhed ſize of the muffle. The heat is ſtronger too, according as the muffle has more and larger ſegments cut out of it, as the ſides of it are thinner, and as the number of veſſels placed in the hinder part of it is increaſed; and the contrary. It may be here obſerved, that when many of the conditions neceſſary to produce ſtrong heat are wanting, the operator, with all his ſagacity, will ſcarcely be able to excite combuſtion in ſuch a degree in common aſſay furnaces as to ſucceed well in his operations; and even when he employs bellows, and introduces coals by the upper door. The grate, therefore, ought to be placed nearly three inches below the muffle, that the air ruſhing through the aſh-hole, may not cool its bottom, and that the ſmaller coals, almoſt already conſumed, and the aſhes, may more eaſily fall through the interſtices of the grate; larger coals, fit for keeping up the requiſite degree of heat, muſt be uſed. The funnel is added, that the blowing of the fire being increaſed by means of it as much as poſſible, may be brought to the degree that is wanted; for the fire may be at any time diminiſhed, but without the aſſiſtance of proper apparatus, it cannot always be increaſed at pleaſure.

Explanation of Fig. 32, 33, and 34.

Fig. 32. Fig. 32, *a*, *a*, *b*, *b*, body of the aſſay furnace.
b b, *c c*, top of the ſame.
d, opening at the top of the furnace.
e, door leading to the aſh-hole.
f, upper door.
g g, *h h*, *i i*, the iron plates rivetted on the furnace, which form the grooves in which the doors ſlide.
k k, *l l*, the ſliding doors.
m, the hole in one of the doors; *n*, the ſemicircular hole.
o o, the holes for receiving the bars which ſupport the muffle.

Furnace. *p*, a hole above the upper edge of the upper door, for introducing a rod to ſtir the fire.

g, the pyramidal cover.

r, tube or funnel at the top.

s s, its handles.

Fig. 33. Fig. 33. repreſents a longitudinal ſection of a reverberatory furnace, 18 feet long, 12 broad, and 9½ high.

a, the building.

b, the aſh-hole.

c, channel for the evaporation of the moiſture.

d, the grate.

e, the fire-place.

f, the inner part of the furnace.

g, a baſon formed of ſand.

h, the cavity containing the melted metal.

i, a hole through which the ſcoria is removed.

k, the paſſage for the flame and ſmoke, or the lower part of the chimney, to be carried to the height of 30 feet.

l, a hole in the roof, through which the ore is introduced into the furnace.

Fig. 34. Fig. 34. is a longitudinal ſection of a refining furnace.

a a, the building.

b, the channels to carry off the moiſture.

c, other ſmall channels, which meet in the middle of the baſon.

d, the baſon made of bricks.

e, a layer of aſhes.

f, the hollow or baſon containing the melted metal.

g, the hole for the ſmoke and flame.

h h, two openings for admitting the pipes of the bellows.

i, the vault or dome of the furnace.

k, the fire-place.

l, the grate.

m, a hole below for the admiſſion of air.

n, a hole in the vault, which ſerves to cool the furnace.

Portable furnace. A convenient portable blaſt furnace, contrived by Mr Aikin, and deſcribed by him in the 17th vol. of the Philoſophical Magazine, will probably be uſeful to ſome of our chemical readers. "It is (he ſays) particularly adapted to thoſe who, like myſelf, can only devote a ſmall room and a moderate ſhare of time to theſe purſuits.

"Dr Lewis, in his Commerce of the Arts (page 27), deſcribes a very powerful baſt furnace formed out of a black-lead pot, which has a number of holes bored at ſmall diſtances in ſpiral lines all over it, from the bottom up to ſuch a height as the fuel is deſigned to reach to. This is let half way into another pot, which laſt receives the nozzle of the bellows, ſo that all the air ſent in is diſtributed through the ſpiral holes of the upper pot, and concentrates the heat of the fuel upon the crucible, which is placed in the midſt.

"The furnace which I am going to deſcribe reſembles very cloſely this of Dr Lewis; with this difference, however, that the air-holes are only bored through the bottom of the pot, and this merely ſtands upon another piece, inſtead of being let into it. It is on this account ſomewhat more commodious, and I imagine not leſs powerful. Furnace.

"Fig. 35. is a view, and fig. 36. a ſection, of the furnace. It is compoſed of three parts, all made out of the common thin black-lead melting pots ſold in London for the uſe of the goldſmiths. The lower piece, A, is the bottom of one of theſe pots cut off ſo low as only to leave a cavity of about one inch, and ground ſmooth, above and below. The outſide diameter over the top is 5½ inches. The middle piece or fireplace, B, is a larger portion of a ſimilar pot with a cavity about ſix inches deep, and meaſuring 7½ inches over the top, outſide diameter, and perforated with ſix blaſt holes at the bottom. Theſe two pots are all that are eſſentially neceſſary to the furnace for moſt operations: but when it is wiſhed to heap up fuel over the top of a crucible contained within, and eſpecially to protect the eyes from the intolerable dazzle of the fire when in full heat, an upper pot, C, is added of the ſame dimenſions as the middle one, and with a large ſide opening cut out to allow an exit to the ſmoke and flame. It has alſo an iron ſtem with a wooden handle (an old chiſel will do very well), to lift it off and on. Fig. 35. & 36.

"The bellows (which are double) are firmly fixed, by a little contrivance which will take off and on, to a heavy ſtool, as is repreſented in the plate; and their handle ſhould be lengthened, to make them work eaſier to the hand. To increaſe their force on particular occaſions, a plate of lead may be tied on the wood of the upper flap. The nozzle is received into a hole in the pot A, which conducts the blaſt into its cavity. From hence the air paſſes into the fire-place, B, through ſix holes, of the ſize of a large gimlet, drilled at equal diſtances through the bottom of the pot, and all converging in an inward direction, ſo that, if prolonged, they would meet about the centre of the upper part of the fire. The larger hole through the middle of the bottom of the ſame pot is for another purpoſe. Fig. 37. is a plan of the ſame, ſhowing the diſtribution of theſe holes. Fig. 37.

"As a ſtand or ſupport for the crucible, I have found no method ſo good as to fit an earthen ſtopper into the bottom of the pot B, through the large centre hole which is made for this purpoſe. This keeps the crucible in its proper place, in ſtirring down the coals and managing the fuel. Theſe ſtoppers are made with great eaſe and expedition out of the ſoftened fire-brick ſold in London. A piece of this brick, made to revolve a few times within a portion of iron or earthenware tube, preſently takes the form of its cavity, and comes out a very neat portion of a cylinder or cone, according to the ſhape of the tube, from which the ſtoppers may readily be faſhioned. Fig. 38. repreſents one of thoſe ſtoppers, which is alſo ſeen in its proper place in fig. 36. ſupporting a crucible. Fig. 38.

"As the conſtruction of this furnace (excluſive of the bellows and its ſtool) is eaſy to any one at all uſed to theſe little manual operations, I truſt that the *working* chemiſt will allow me to add a few words on the method which I have found the moſt convenient and economical. Almoſt any broken pot of the proper width will furniſh the lower piece A; and often the middle and upper pieces may be contrived out of the ſame refuſe matter. Dr Lewis adviſes a ſaw to cut theſe pots; but

Fig. 1.

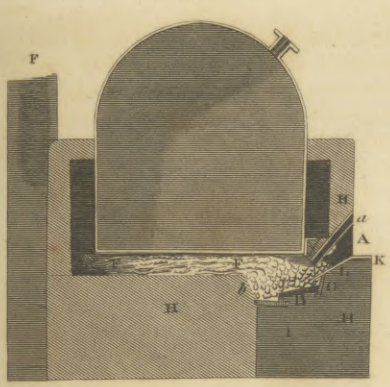


Fig. 2.

Fig. 5.

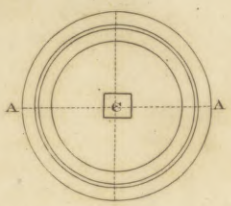
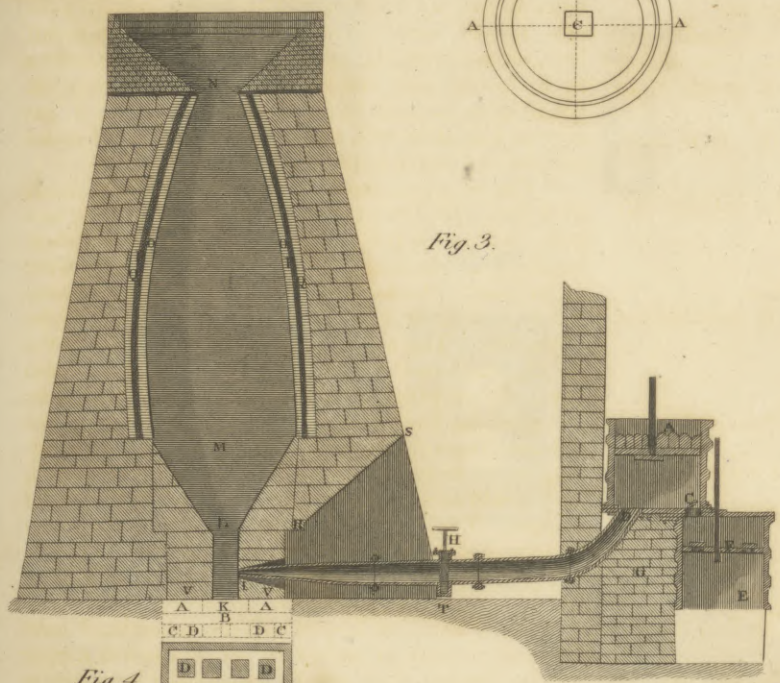


Fig. 3.



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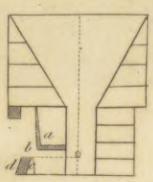

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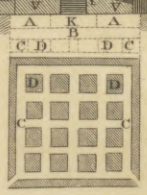

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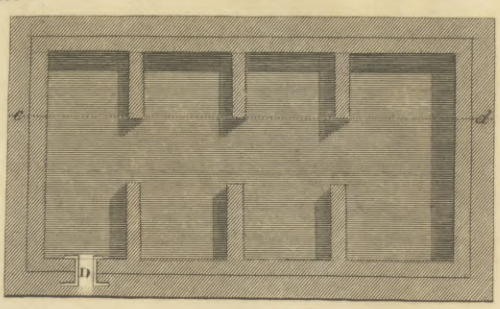

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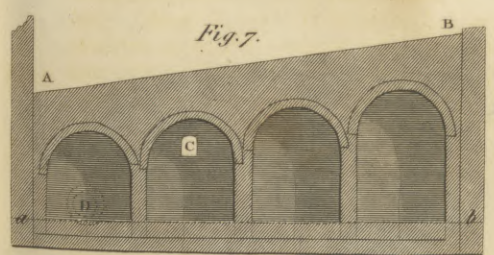

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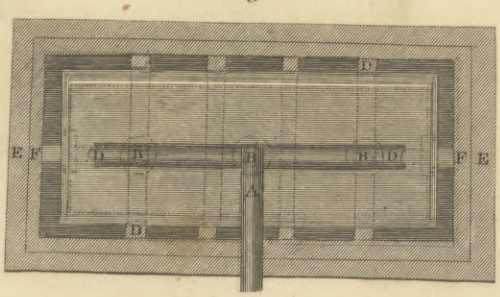

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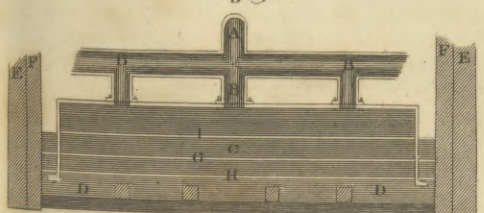


E. Mitchell sculp.

Fig. II.

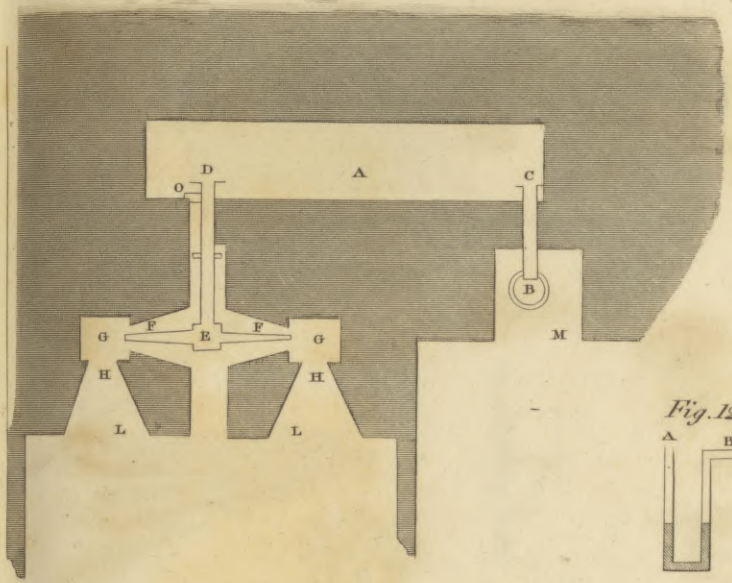


Fig. 12.

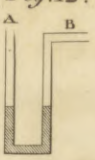
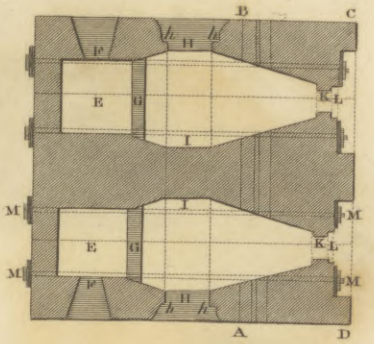


Fig. 13.



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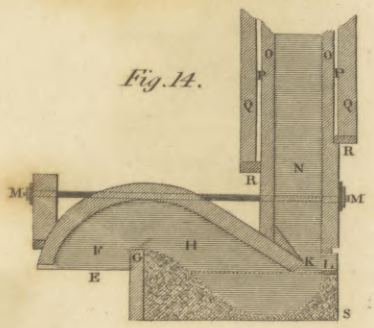

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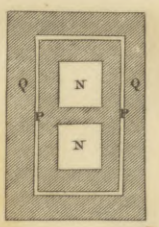

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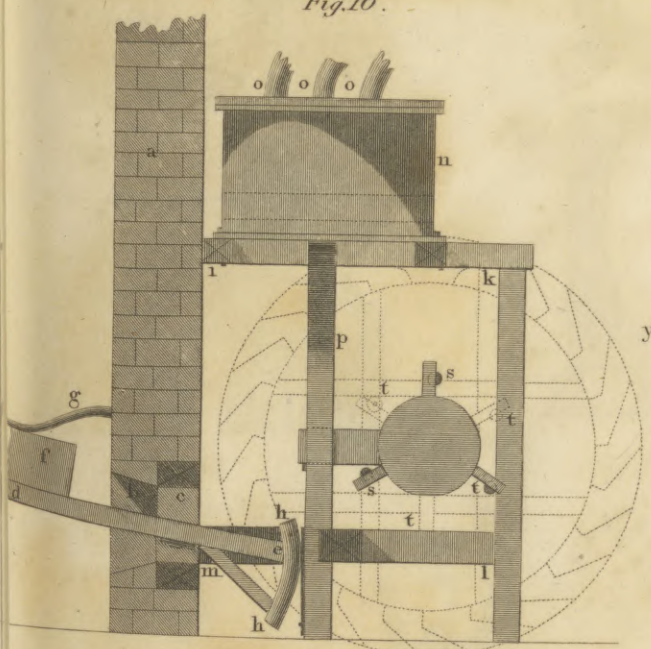

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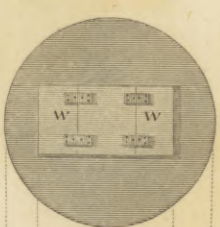
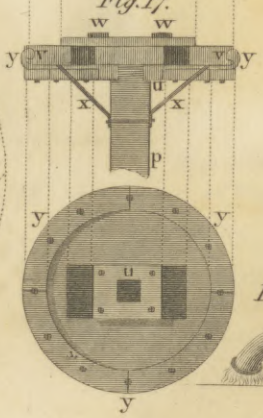


Fig. 17.



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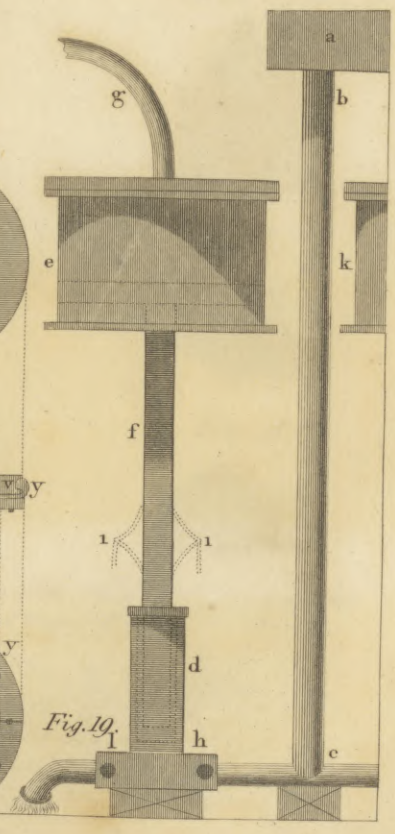
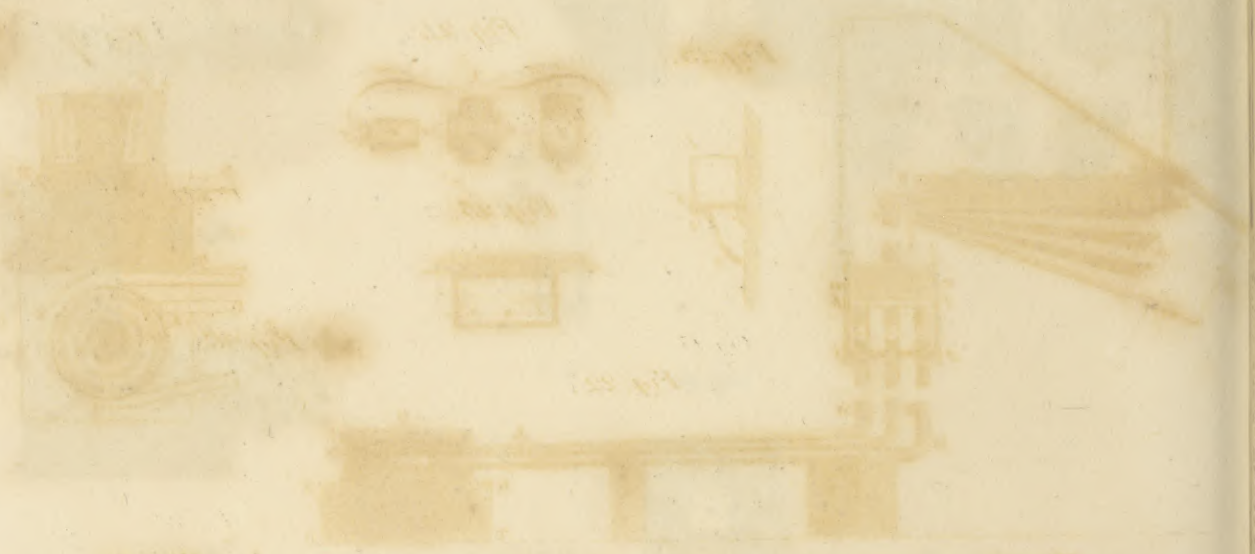


Fig. 19.

E. Mitchell sculp.



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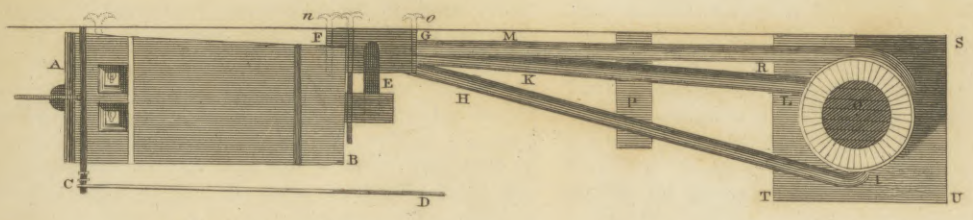

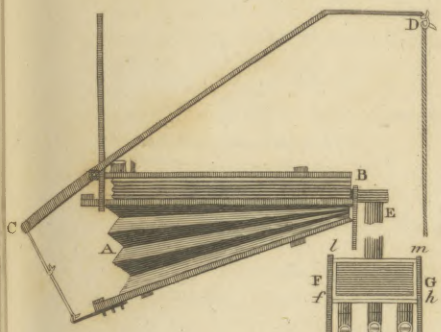

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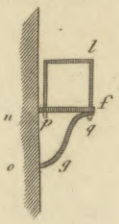

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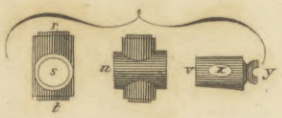

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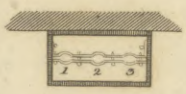


Fig. 27.

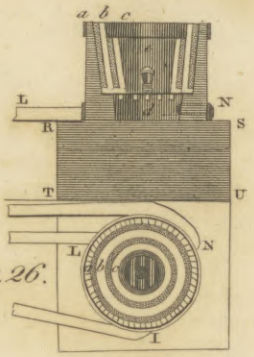
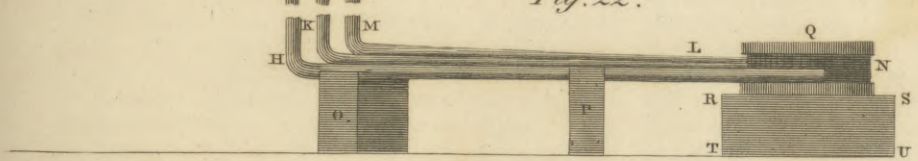


Fig. 26.

Fig. 22.



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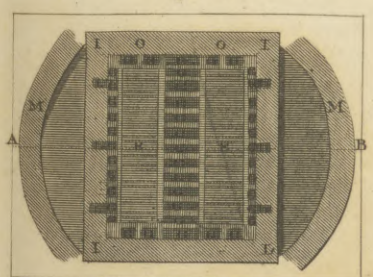

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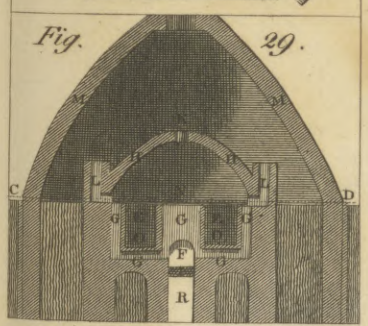

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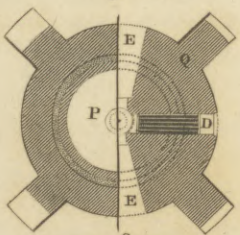

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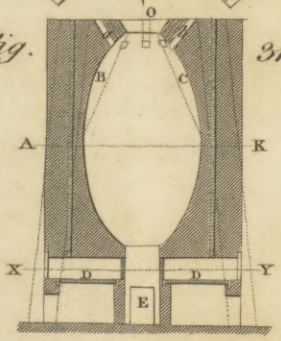

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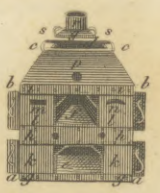
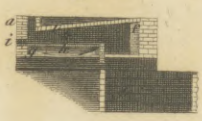


Fig. 33.



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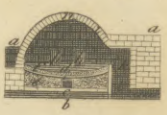


Fig. 35.

Fig. 36.

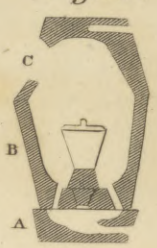
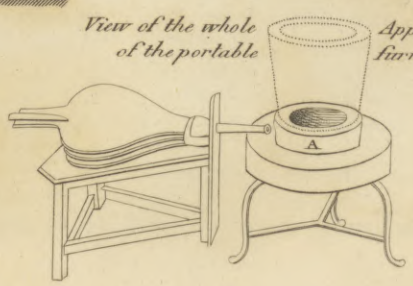
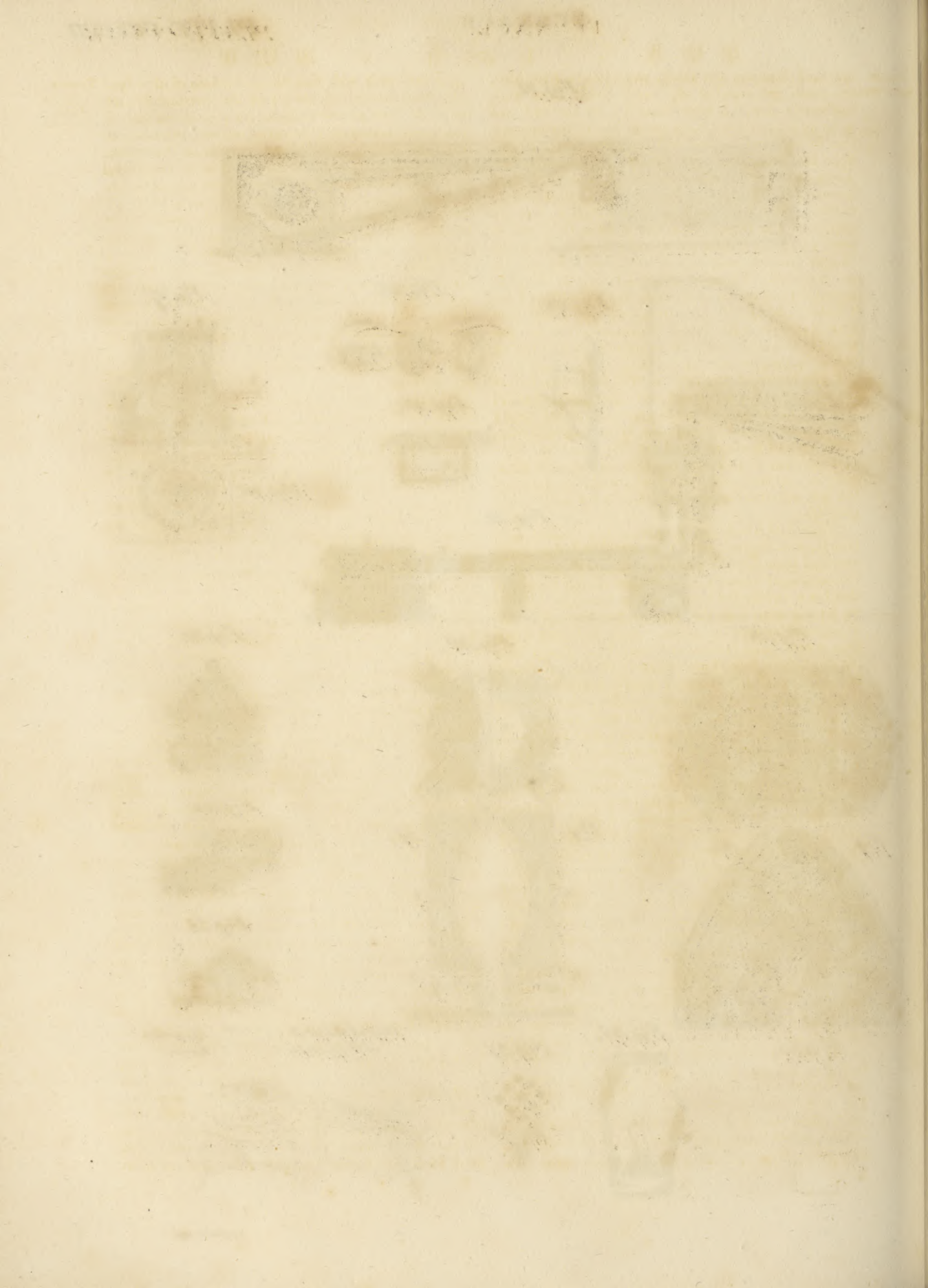


Fig. 37.

Fig. 38.

View of the whole Apparatus of the portable furnace.





Furnace. but moſt ſaws are too thick, and when a little uſed, the teeth get rounded off, which makes them work intolerably ſlow. I have found by far the beſt tool to be an old table knife, or rather two of them, worn thin by uſe, and hacked and jagged as deeply as poſſible, by ſtriking the edges ſtrongly againſt each other. Theſe work well and expeditiouſly, and when they become dull are again roughened by the ſame ſimple means. The holes may be drilled with a common gimlet of the largeſt ſize, and a little ſteadineſs of hand will eaſily enable the operator to give them the oblique direction with ſufficient accuracy; for much is not required. To make a ſmooth ſurface to the parts intended to adapt to each other, firſt wear them down a little with the ſoft fire-brick, and then grind them with water on a flat free-ſtone (a ſink-ſtone for example), and laſtly make them entirely fit by rubbing one ſurface on the other.

"No luting of any kind is ever required; ſo that the whole may be ſet up and taken down immediately. Nor is it neceſſary to bind the pots with metal hoops; for they are thick enough to endure conſiderable blows without breaking; and yet they will bear, without cracking, to be heated as ſuddenly and intenſely as poſſible. In ſhort, the black-lead crucible ſeems to be the beſt material that could poſſibly be deviſed for theſe purpoſes.

"The heat which this little furnace will afford is ſo intenſe, and ſo much more than would at firſt ſight be expected from ſo trifling an apparatus, that it was only the accidental fuſion of a thick piece of caſt iron in it that led us to ſuſpect its power. The utmoſt heat which we have procured in this furnace has been 167° of a Wedgwood pyrometer piece, which was withdrawn from a very ſmall Heſſian crucible when actually ſinking down in a ſtate of porcellanous fuſion. A ſteady heat of 150° to 155° may be uſually depended on, if the fire be properly managed and the bellows worked with vigour. This is ſufficient for moſt operations in chemiſtry; and the economy in time and fuel is extreme, ſince a furnace of the given dimenſions will very well raiſe to the above point of heat in from five to ten minutes a Heſſian crucible of ſuch a diameter, that the average thickneſs of burning fuel around its bottom is not more than one inch and a half. A ſmaller crucible will take a higher heat, but at the riſk of its ſoftening and falling in by the weight of the incumbent fuel.

"Coak, or common cinders taken from the fire juſt when the coal ceaſes to blaze, and broken into very ſmall pieces, with the duſt ſifted away, form the beſt fuel for the higheſt heat. A light ſpongy kind of coak, formed of a mixture of coal and charcoal, called *Davey's patent coal*, alſo anſwers extremely well. Charcoal alone has not weight enough, when broken ſo ſmall as it muſt be to lie cloſe in this little fire-place, to withſtand the force of the blaſt when very violent. A bit of lighted paper, a handful of the very ſmall charcoal, called in London *ſmall coal*, and ten or a dozen ſtrokes of the bellows, will kindle the fire in almoſt as many ſeconds.

"Various little alterations and arrangements, which will readily occur to the practical chemiſt, will fit this little apparatus for diſtillation with an earthen retort, heating a gun-barrel paſſed through the fire, bending glaſs tubes, &c.

"I ſhall only add, that the dimenſions of this furnace were determined merely by the circumſtance of having at hand pieces of black-lead pots of this ſize, ſo that doubtleſs they may be varied without any diminution, and probably with ſome increaſe of the effect. The ſame may be ſaid of the number of holes; for in another inſtance four appeared to anſwer as well as ſix, with this difference, however, that, by long working, the melted ſlag of the coak will now and then partially block up one or two of the holes; on which account perhaps the greater number is preferable *." Furnace || Furr.

* *Phil. Mag.* xvii, 166.

FURNITURE, a term in dialling, which denotes certain additional points and lines drawn on a dial, by way of ornament, ſuch as the ſigns of the zodiac, length of days, parallels of declination, azimuths, points of the compaſs, meridians of chief cities, Babylonic, Jewiſh, or Italian hours, &c.

FUROR UTERINUS, a diſorder peculiar to women. See MEDICINE *Index*.

FURR, or FUR, in *Commerce*, ſignifies the ſkin of ſeveral wild beaſts, dreſſed in alum with the hair on; and uſed as a part of dreſs, by princes, magiſtrates, and others. The kinds moſt in uſe are thoſe of the ermine, ſable, caſtor, hare, rabbit, &c. See MUSTELA.

It was not till the later ages that the furs of beaſts became an article of luxury. The more refined nations of ancient times never made uſe of them; thoſe alone whom the former ſtigmatized as barbarians were clothed in the ſkins of animals. Strabo deſcribes the Indians covered with the ſkins of lions, panthers, and bears; and Seneca, the Scythians clothed with the ſkins of foxes and the leſſer quadrupeds. Virgil exhibits a picture of the ſavage Hyperboreans, ſimilar to that which our late circumnavigators can witneſs to in the clothing of the wild Americans, unſeen before by any poliſhed people.

Gens effræna virûm Riphæo tunditur Euro;
Et pecudum fulvis velantur corpora ſetis.

Moſt part of Europe was at this time in ſimilar circumſtances. Cæſar might be as much amazed with the ſkin-dreſſed heroes of Britain, as our celebrated Cook was at thoſe of his new-diſcovered regions. What time has done to us, time, under humane conquerors, may effect for them. Civilization may take place; and thoſe ſpoils of animals, which are at preſent eſſential for clothing, become the mere objects of ornament and luxury.

It does not appear that the Greeks or old Romans ever made uſe of furs. It originated in thoſe regions where they moſt abounded, and where the ſeverity of the climate required that ſpecies of clothing. At firſt it conſiſted of the ſkins only, almoſt in the ſtate in which they were torn from the body of the beaſt; but as ſoon as civilization took place, and manufactures were introduced, furs became the lining of the dreſs, and often the elegant facing of the robes. It is probable that the northern conquerors introduced the faſhion into Europe. We find, that about the year 522, when Totila king of the Viſigoths reigned in Italy, the Suethons (a people of modern Sweden), found means, by help of the commerce of numberleſs intervening people, to tranſmit, for the uſe of the Romans, *ſaphilinas pelles*, the precious ſkins of the ſables. As luxury advanced, furs, even of the moſt valuable

Furr. ſpecies, were uſed by princes as linings for their tents: thus Marco Polo, in 1252, found thoſe of the Cham of Tartary lined with ermines and ſables. He calls the laſt *zibelines* and *zambolines*. He ſays that thoſe and other precious furs were brought from countries far north; from the *land of Darkneſs*, and regions almoſt inacceſſible by reaſon of moraſſes and ice. The Welſh ſet a high value on furs as early as the time of Howel Dda, who began his reign about 940. In the next age, furs became the faſhionable magnificence of Europe. When Godfrey of Boulogne and his followers appeared before the emperor Alexis Comnenus, on their way to the Holy Land, he was ſtruck with the richneſs of their dreſſes, *tam ex oſtro quam aurifrigio et niveo opere harmelino et ex mardrino griſioque et vario.* How different was the advance of luxury in France from the time of their great monarch Charlemagne, who contented himſelf with the plain fur of the otter! Our Henry I. wore furs; yet in his diſtreſs was obliged to change them for warm Welſh flannel. But in the year 1337 the luxury had got to ſuch a head, that Edward III. enacted, that all perſons who could not ſpend a hundred a-year ſhould abſolutely be prohibited the uſe of this ſpecies of finery. Theſe, from their great expence, muſt have been foreign furs, obtained from the Italian commercial ſtates, whoſe traffic was at this period boundleſs. How ſtrange is the revolution in the fur-trade! The north of Aſia at that time ſupplied us with every valuable kind; at preſent we ſend, by means of the poſſeſſion of Hudſon's Bay, furs, to immenſe amount, even to Turkey and the diſtant China.

Hiſtory of the FUR *Trade.*—During Captain Cook's laſt voyage to the Pacific ocean, beſides the various ſcientific advantages which were derived from it, a new ſource of wealth was laid open to future navigators, by trading for furs of the moſt valuable kind on the north-weſt coaſt of America. The firſt veſſel which engaged in the new branch of trade pointed out by that great navigator, was equipped by ſome gentlemen in China. She was a brig of 60 tons and 20 men, commanded by James Hanna. She ſailed from the Typa the end of April 1785; proceeded to the northward, along the coaſt of China; paſſed through Diemen's ſtraits, the ſouth end of Japan; and arrived at Nootka in Auguſt following. Soon after her arrival, the natives, whom Captain Cook had left unacquainted with the effect of fire-arms, tempted probably by the diminutive ſize of the veſſel (ſcarce longer than ſome of their own canoes) and the ſmall number of her people, attempted to board her in open day; but were repulſed with conſiderable ſlaughter. This was the introduction to a firm and laſting friendſhip. Captain Hanna cured ſuch of the Indians as were wounded; an unreſerved confidence took place; they traded fairly and peaceably; a valuable cargo of furs was procured; and the bad weather ſetting in, he left the coaſt in the end of September, touched at the Sandwich iſlands, and arrived at Macao the end of December of the ſame year.

Captain Hanna ſailed again from Macao in May 1786, in the ſnow Sea-Otter of 120 tons and 30 men, and returned to Macao in February 1787. In this ſecond voyage he followed his former track, and arrived at Nootka in Auguſt; traced the coaſt from thence as far as 53 degrees, and explored the extenſive ſound diſcovered a ſhort time before by Mr Strange, and called by him Queen Charlotte's ſound, the latitude of which is 51 degrees north, longitude 128 weſt. Furr.

The ſnow Lark, Captain Peters, of 220 tons and 40 men, ſailed from Macao in July 1786. Her deſtination was Kamtſchatka (for which ſhe was provided with a ſuitable cargo of arrack, tea, &c.), Copper iſlands, and the N. W. coaſt. Captain Peters was directed to make his paſſage between Japan and Corea, and examine the iſlands to the north of Japan, ſaid to be inhabited by hairy people; which, if Captain Cook had lived, would not have been left to the French to determine. No account having been received of this veſſel ſince her departure, there is every reaſon to fear ſhe has periſhed.

In the beginning of 1786, two coppered veſſels were fitted out at Bombay, under the direction of James Strange, Eſq. who was himſelf a principal owner. Theſe veſſels were, the ſnow Captain Cook of 300 tons, and ſnow Experiment of 100 tons. They proceeded in company from the Malabar coaſt to Batavia; paſſed through the ſtraits of Macaſſar, where the Experiment was run upon a reef, and was obliged to haul aſhore upon Borneo to repair; from thence they ſteered to the eaſtward of the Palaos iſlands; made Sulphur iſland; and arrived at Nootka the end of June following. From Nootka, where they left their ſurgeon's mate (Mackay) to learn the language and collect ſkins againſt their intended return (but who was brought away in the Imperial Eagle the following year), they proceeded along the coaſt to Queen Charlotte's ſound, of which they were the firſt diſcoverers; from thence in a direct courſe to Prince William's ſound. After ſome ſtay there, the Experiment proceeded to Macao (their veſſels being provided with paſſes by the governor-general of Goa): the Captain Cook endeavoured to get to Copper iſland, but without ſucceſs, being prevented by conſtant weſt winds.

Two coppered veſſels were alſo fitted out by a ſociety of gentlemen in Bengal, viz. the ſnow Nootka of 200 tons, and the ſnow Sea Otter of 100 tons, commanded by John Meares and William Tipping, lieutenants in the royal navy. The Nootka ſailed in March 1786 from Bengal; came through the China ſeas; touched at the Baſhees, where they were very civilly treated by the Spaniards, who have taken poſſeſſion of theſe iſlands; arrived at Oonalaſhka the beginning of Auguſt; found there a Ruſſian galliot and ſome furriers; diſcovered accidentally near Cape Greville a new ſtrait near Cook's river, 15 leagues wide and 30 long; ſaw ſome Ruſſian hunters in a ſmall bay between Cape Elizabeth and Cape Bear; and arrived in Prince William's ſound the end of September. They determined wintering in Snug Corner Cove, lat. 60. 30. in preference to going to the Sandwich iſlands, which ſeem placed by Providence for the comfort and refreſhment of the adventurers in this trade, and were frozen up in this gloomy and frightful ſpot from the end of November to the end of May. By the ſeverity of the winter they loſt their third and fourth mates, ſurgeon, boatſwain, carpenter, and cooper, and twelve of the fore-maſt-men; and the remainder were ſo enfeebled as to be under the neceſſity of applying

Furr. ing to the commanders of the King George and Queen Charlotte, who juſt at this time arrived in the ſound, for ſome hands to aſſiſt in carrying the veſſel to the Sandwich iſlands, where, giving over all further thoughts of trade, they determined (after getting a ſea-ſtock of fiſh off Cape Edgecumbe) immediately to proceed. The Nootka arrived at Macao the end of October 1787.

The Imperial Eagle, Captain Barkley, fitted out by a ſociety of gentlemen at Oſtend, ſailed from Oſtend the latter end of November 1786; went into the bay of All Saints; from thence, without touching anywhere, to the Sandwich iſlands, and arrived at Nootka the beginning of June; from thence to the ſouth, as far as 47° 30′, in which ſpace he diſcovered ſome good and ſpacious harbours. In the lat. of 47° 46′, loſt his ſecond mate, purſer, and two ſeamen, who were upon a trading party with the long-boat, and imprudently truſting themſelves aſhore unarmed, were cut off by the natives. This place ſeems to be the ſame that Don Antonio Mourelle calls the *Iſla de los Dolores*, where the Spaniards going aſhore to water, were alſo attacked and cut off.

The King George of 320, and the Queen Charlotte of 200 tons, commanded by Captains Portlock and Dixon, who ſerved under Captain Cook in his laſt voyage, were fitted out by a ſociety of gentlemen in England, who obtained a privilege to trade to the north-weſt coaſt of America, from the South Sea and Eaſt India companies.

Theſe veſſels ſailed from England the beginning of September 1785; touched at the Falkland iſlands, Sandwich iſlands, and arrived at Cook's river in the month of Auguſt. From thence, after collecting a few furs, they ſteered in the end of September for Prince William's ſound, intending, it is ſaid, to winter there; but were prevented entering by heavy ſtorms and extreme bad weather, which obliged them to bear away, and ſeek ſome other part of the coaſt to winter at. The ſtorms and bad weather accompanied them till they arrived off Nootka ſound, when they were ſo near the ſhore, that a canoe came off to them: but though thus near accompliſhing their purpoſe, a freſh ſtorm came on, and obliged them finally to bear away for the Sandwich iſlands, where they remained the winter months; and returning again to the coaſt, arrived in Prince William's ſound the middle of May. The King George remained in Prince William's ſound; and during her ſtay, her long-boat diſcovered a new paſſage from the ſound into Cook's river. The Queen Charlotte proceeded along the coaſt to the ſouth; looked into Behring's bay, where the Ruſſians have now a ſettlement; examined that part of the coaſt from 56° to 50°, which was not ſeen by Captain Cook, and which conſiſts of a cluſter of iſlands, called by Captain Dixon *Queen Charlote's Iſlands*, at a conſiderable diſtance from the main, which is thus removed farther to the eaſtward than it was ſuppoſed to be: ſome part of the continent may, however, be ſeen from the eaſt ſide of theſe iſlands; and it is probable the diſtance does not anywhere exceed 50 leagues. On this eſtimation, Hudſon's Houſe, lat. 53°, long. 106° 27′ weſt, will not be more than 800 miles diſtant from that part of this coaſt in the ſame parallel. It is therefore not improbable, that the enterpriſing ſpirit of our Canadian furriers may penetrate to this coaſt (the communication with which is probably much facilitated by lakes or rivers), and add to the comforts and luxuries of Europe this invaluable fur, which in warmth, beauty, and magnificence, far exceeds the richeſt furs of Siberia. Queen Charlotte's iſlands are inhabited by a race of people differing in language, features, and manners, from all the other tribes of this coaſt. Among other peculiarities, they are diſtinguiſhed by a large inciſion in the under lip, in which is inſerted a piece of poliſhed wood, ſometimes ornamented with mother of pearl ſhell, in ſhape and ſize like a weaver's ſhuttle, which undoubtedly is the moſt effectual mode of deforming the human face divine that the ingenious depravity of taſte of any ſavage nation has yet diſcovered. Theſe ſhips, after diſpoſing of their furs in China, were loaded with teas on account of the Engliſh company, ſailed from Wampoa, and arrived in England, after an abſence of three years. Furr.

The year after the departure of the King George and Queen Charlotte, the ſame ſociety to which they belonged fitted out two other veſſels, viz. the Princeſs Royal of 60 tons, and the Prince of Wales of 200 tons, commanded by Captains Colnet and Duncan, the former of whom had ſerved under Captain Cook. Theſe veſſels left England in Auguſt 1786; touched at New Year's harbour on Staten Land, where they left an officer and 12 men to kill ſeals againſt the arrival of a veſſel which was to follow them from England; from thence they proceeded directly to Nootka, where they arrived the 6th of July, ſickly and in bad condition, and found here the Imperial Eagle, which had left Europe ſome months after them. Leaving Nootka, they ſteered along the ſhore to the northward, and ſoon after fell in with the Queen Charlotte.

In the beginning of 1788, Captain Mears ſailed again with two other veſſels, the Felice, which he commanded himſelf, and the Iphigenia, Captain Douglas, to Nootka ſound. Here he purchaſed of the chief of the diſtrict a ſpot, on which he built a houſe for his reſidence and more convenient intercourſe with the natives, hoiſting the Britiſh colours thereon, ſurrounding it with a breaſt-work, and mounting a three pounder on the front. Having ſo done, he ſent Mr Douglas in the Iphigenia to trade along the northern coaſt, while he himſelf proceeded to the ſouth; and by preſents to the chiefs obtained the ports Cox and Effingham, and the promiſe of an excluſive trade with the natives of the diſtrict, and alſo ſome other places, which he took poſſeſſion of in the name of the king. Captain Douglas likewiſe, by preſents to the chiefs of the countries he viſited, obtained ſimilar privileges, no other European veſſel having ſailed there before him.

On their return to Nootka, they found a veſſel finiſhed which the commander had laid down before his departure. This, which he named the North Weſt America, he left at Nootka with the Iphigenia, while he ſailed with a cargo of furs in the Felice to China.

A few days after his arrival at China, two veſſels, the Prince of Wales and Princeſs Royal, came to Canton from their trading voyage above mentioned. Captain Mears, fearing a competition of intereſts might be injurious to both parties, propoſed a copartnerſhip,

Fur. which was mutually agreed to; and another ſhip was purchaſed by the firm, and called the *Argonaut*. In the month of April 1787, Captain Mears gave Mr Colnet the command of the Princeſs Royal and Argonaut, which were loaded with ſtores and articles eſtimated ſufficient for three years trade, beſides ſeveral artificers, and near 70 Chineſe, who intended to become ſettlers on the north-weſt coaſt of America, under protection of the new company.

In the mean while, the Iphigenia, and North-Weſt America (the veſſel built at Nookta) having wintered in Sandwich iſlands, returned to Nootka in the latter end of April. Soon after which, two Spaniſh ſhips of war, under the command of Don Martinez, anchored in the ſound. For a few days mutual civilities paſſed between the Spaniſh captain and Mr Douglas; but at the end of about a week, Don Martinez ſummoned the latter on board his own ſhip the Princeſſa, telling him he was his priſoner, and that the king of Spain had commanded him, Don Martinez, to ſeize all veſſels he ſhould find on that coaſt. He therefore inſtructed his officers to take poſſeſſion of the Iphigenia, which they accordingly did in the name of his Catholic majeſty; and the officers and crew were conveyed as priſoners on board the Spaniſh ſhips, where they were put in irons, and otherwiſe ill treated. Immediately after this, Don Martinez took poſſeſſion of the little ſettlement, hoiſting the ſtandard of Spain, and modeſtly declaring all the lands from Cape Horn to 60 degrees north latitude belonged to his maſter. To aggravate the inſult, he forcibly employed the crew of the Iphigenia in building batteries, &c. and offered no kind of violence to two American veſſels that were at the ſame time in the harbour. At this time the North-Weſt America was ſent to explore the Archipelago of St Lazarus. On her return to Nootka, ſhe met with a ſimilar treatment, and the ſkins ſhe had collected were ſeized, with the reſt of her cargo.

A few days after the Princeſs Royal (which we have mentioned as leaving Canton in company with the Argonaut) arrived. The Spaniſh commander, for reaſons that do not appear, ſuffered her to depart. The ſkins collected by the North-Weſt America were ſhipped on board her for the benefit of her owner, and ſhe proceeded to trade in the neighbouring iſles. On the 3d of July, the Argonaut arrived at the ſound; and Don Martinez, after making every profeſſion of civility to Mr Colnet the commander, took poſſeſſion of the ſaid ſhip in the name of his maſter, and made priſoners of the crew. Soon after, the Princeſs Royal returning to receive inſtructions from Mr Colnet, director of the enterpriſe, was ſeized by the Spaniſh captain.

The crews of the Britiſh veſſels were differently diſpoſed of; ſome ſent to China by the American veſſels, and others to Spaniſh America: but the Chineſe were all detained, and employed in the mines which were opened on the lands purchaſed by Captain Mears. What theſe mines conſiſted of, we are nowhere informed. Mr Colnet was ſo much affected at the failure of the enterpriſe, as to be deprived of reaſon.

This, as ſoon as known, occaſioned a ſpirited repreſentation from the Britiſh court to that of Spain; at the ſame time that vigorous preparations were made for war in caſe adequate ſatisfaction ſhould be refuſed. Matters, however, were prevented from coming to extremities, by a compliance on the part of Spain, after many delays and much artifice of negotiation, with the requiſitions of Britain: in conſequence of which, among other advantages unneceſſary to be here recited, the whole trade from California to China is completely laid open; and the Britiſh allowed the full exerciſe of navigation and commerce in thoſe parts of the world which were the ſubject of diſcuſſion. Furr.

In ſome accounts of the voyages above mentioned, the fur trade in thoſe parts has been greatly magnified. In that publiſhed by Captain Portlock, however, this officer obſerves, that the gains hitherto have certainly not been enviably great; though the merchants have no doubt found the trade lucrative.

Hiſtory of the FUR *Trade from Canada to the North-weſt.*—The following account of this trade is extracted from Mr Mackenzie's Narrative of his voyages and Travels from Montreal, through the North-weſt Continent of America, and to the Pacific ocean.

"The fur trade, he ſays, from the earlieſt ſettlement of Canada, was conſidered of the firſt importance to that colony. The country was then ſo populous, that, in the vicinity of the eſtabliſhments, the animals whoſe ſkins were precious, in a commercial view, ſoon became very ſcarce, if not altogether extinct. They were, it is true, hunted at former periods, but merely for food and clothing. The Indians, therefore, to procure the neceſſary ſupply, were encouraged to penetrate into the country, and were generally accompanied by ſome of the Canadians, who found means to induce the remoteſt tribes of natives to bring the ſkins which were moſt in demand, to their ſettlements, in the way of trade.

"It is not neceſſary for me to examine the cauſe, but experience proves that it requires much leſs time for a civilized people to deviate into the manners and cuſtoms of ſavage life, than for ſavages to riſe into a ſtate of civilization. Such was the event with thoſe who thus accompanied the natives on their hunting and trading excurſions; for they became ſo attached to the Indian mode of life, that they loſt all reliſh for their former habits and native homes. Hence they derived the title of *Coureurs des Bois*, became a kind of pedlars, and were extremely uſeful to the merchants engaged in the fur trade; who gave them the neceſſary credit to proceed on their commercial undertakings. Three or four of theſe people would join their ſtock, put their property into a birch-bark canoe, which they worked themſelves, and either accompanied the natives in their excurſions, or went at once to the country where they knew they were to hunt. At length, theſe voyages extended to 12 or 15 months, when they returned with rich cargoes of furs, and followed by great numbers of the natives. During the ſhort time requiſite to ſettle their accounts with the merchants, and procure freſh credit, they generally contrived to ſquander away all their gains, when they returned to their favourite mode of life: their views being anſwered, and their labour ſufficiently rewarded, by indulging themſelves in extravagance and diſſipation during the ſhort ſpace of one month in 12 or 15.

"The indifference about amaſſing property, and the pleaſure of living free from all reſtraint, ſoon brought on a licentiouſneſs of manners which could not long eſcape the vigilant obſervation of the miſſionaries, who had

Furr. had much reaſon to complain of their being a diſgrace to the Chriſtian religion; by not only ſwerving from its duties themſelves, but by thus bringing it into diſrepute with thoſe of the natives who had become converts to it; and, conſequently, obſtructing the great object to which thoſe pious men had devoted their lives. They, therefore, exerted their influence to procure the ſuppreſſion of theſe people, and accordingly, no one was allowed to go up the country to traffic with the Indians, without a licence from the government.

"At length, military poſts were eſtabliſhed at the confluence of the different large lakes of Canada, which, in a great meaſure, checked evil conſequences that followed from the improper conduct of theſe foreſters, and, at the ſame time, protected the trade. Beſides, a number of able and reſpectable men retired from the army, proſecuted the trade in perſon, under their reſpective licences, with great order and regularity, and extended it to ſuch a diſtance, as, in thoſe days, was conſidered to be an aſtoniſhing effort of commercial enterprize. Theſe perſons and the miſſionaries having combined their views at the ſame time, ſecured the reſpect of the natives, and the obedience of the people neceſſarily employed in the laborious parts of this undertaking. Theſe gentlemen denominated themſelves commanders, and not traders, though they were intitled to both thoſe characters: and, as for the miſſionaries, if ſufferings and hardſhips in the proſecution of the great work which they had undertaken, deſerved applauſe and admiration, they had an undoubted claim to be admired and applauded: they ſpared no labour and avoided no danger in the execution of their important office; and it is to be ſeriouſly lamented, that their pious endeavours did not meet with the ſucceſs which they deſerved: for there is hardly a trace to be found, beyond the cultivated parts, of their meritorious functions.

"This cauſe of the failure muſt be attributed to a want of due conſideration in the mode employed by the miſſionaries to propagate the religion of which they were the zealous miniſters. They habituated themſelves to the ſavage life, and naturaliſed themſelves to the ſavage manners, and, by thus becoming dependant, as it were, on the natives, they acquired their contempt rather than their veneration. If they had been as well acquired with human nature, as they were with the articles of their faith, they would have known, that the uncultivated mind of an Indian muſt be diſpoſed by much preparatory method and inſtruction to receive the revealed truths of Chriſtianity, to act under its ſanctions, and be impelled to good by the hope of its rewards, or turned from evil by the fear of its puniſhments. They ſhould have begun their work by teaching ſome of thoſe uſeful arts which are the inlets of knowledge, and lead the mind by degrees to objects of higher comprehenſion. Agriculture ſo formed to fix and combine ſociety, and ſo preparatory to objects of ſuperior conſideration, ſhould have been the firſt thing introduced among a ſavage people: it attaches the wandering tribe to that ſpot where it adds ſo much to their comforts; while it gives them a ſenſe of property, and of laſting poſſeſſion, inſtead of the uncertain hopes of the chaſe, and the fugitive produce of uncultivated wilds. Such were the means by which the foreſts of Paraguay were converted into a ſcene of abundant cultivation, and its ſavage inhabitants introduced to all the advantages of a civilized life. Furr.

"The Canadian miſſionaries ſhould have been contented to improve the morals of their own countrymen, ſo that by meliorating their character and conduct, they would have given a ſtriking example of the effect of religion in promoting the comforts of life to the ſurrounding ſavages; and might by degrees have extended its benign influence to the remoteſt region of that country, which was the object, and intended to be the ſcene, of their evangelic labours. But by bearing the light of the goſpel at once to the diſtance of 2500 miles from the civilized part of the colonies, it was ſoon obſcured by the cloud of ignorance that darkened the human mind in thoſe diſtant regions.

"The whole of their long route I have often travelled, and the recollection of ſuch a people as the miſſionaries having been there, was confined to a few ſuperannuated Canadians, who had not left that country ſince the ceſſion to the Engliſh, in 1763, and who particularly mentioned the death of ſome, and the diſtreſſing ſituation of them all. But if theſe religious men did not attain the objects of their perſevering piety, they were, during their miſſion, of great ſervice to the commanders who engaged in thoſe diſtant expeditions, and ſpread the fur trade as far weſt as the bank of the Saſkatchiwine river, in 53° north latitude, and longitude 102° weſt.

"At an early period of their intercourſe with the ſavages, a cuſtom was introduced of a very excellent tendency, but is now unfortunately diſcontinued, of not ſelling any ſpirituous liquor to the natives. This admirable regulation was for ſome time obſerved, with all the reſpect due to the religion by which it was ſanctioned, and whoſe ſevereſt cenſures followed the violation of it. A painful penance could alone reſtore the offender to the ſuſpended rites of the ſacrament. The caſuiſtry of trade, however, diſcovered a way to gratify the Indians with their favourite cordial, without incurring the eccleſiaſtical penalties, by giving, inſtead of ſelling it to them.

"But notwithſtanding all the reſtrictions with which commerce was oppreſſed under the French government, the fur trade was extended to the immenſe diſtance which has been already ſtated; and ſurmounted many moſt diſcouraging difficulties, which will be hereafter noticed; while, at the ſame time, no exertions were made from Hudſon's Bay to obtain even a ſhare of the trade of a country which, according to the charter of that company, belonged to it, and, from its proximity, is ſo much more acceſſible to the mercantile adventurer.

"Of theſe trading commanders, I underſtood, that two attempted to penetrate to the Pacific ocean, but the utmoſt extent of their journey I could never learn; which may be attributed, indeed, to a failure of the undertaking.

"For ſome time after the conqueſt of Canada, this trade was ſuſpended, which muſt have been very advantageous to the Hudſon's Bay company, as all the inhabitants to the weſtward of Lake Superior were obliged to go to them for ſuch articles as their habitual uſe had rendered neceſſary. Some of the Canadians who had lived long with them, and were become attached

Furr. tached to a ſavage life, accompanied them thither annually, till mercantile adventurers again appeared from their own country, after an interval of ſeveral years, owing, I ſuppoſe, to an ignorance of the country in the conquerors, and their want of commercial confidence in the conquered. There were, indeed, other diſcouragements, ſuch as the immenſe length of the journey neceſſary to reach the limits beyond which this commerce muſt begin; the riſk of property; the expences attending ſuch a long tranſport; and an ignorance of the language of thoſe who, from their experience, muſt be neceſſarily employed as the intermediate agents between them and the natives. But, notwithſtanding theſe difficulties, the trade, by degrees, began to ſpread over different parts to which it had been carried by the French, though at a great riſk of the lives, as well as the property, of their new poſſeſſors, for the natives had been taught by their former allies to entertain hoſtile diſpoſitions towards the Engliſh, from their having been in alliance with their natural enemies the Iroquois; and there were not wanting a ſufficient number of diſcontented, diſappointed people to keep alive ſuch a notion; ſo that for a long time they were conſidered and treated as objects of hoſtility. To prove this diſpoſition of the Indians, we have only to refer to the conduct of Pontiac, at Detroit, and the ſurpriſe and taking of Michilimakinac, about this period.

"Hence it aroſe, that it was ſo late as the year 1766, before which the trade I mean to conſider commenced from Michilimakinac. The firſt who attempted it were ſatisfied to go the length of the river Cameniſtiquia, about 30 miles to the eaſtward of the Grande Portage, where the French had a principal eſtabliſhment, and was the line of their communication with the interior country. It was once deſtroyed by fire. Here they went, and returned ſucceſsful in the following ſpring to Michilimakinac. Their ſucceſs induced them to renew their journey, and incited others to follow their example. Some of them remained at Cameniſtiquia, while others proceeded to and beyond the Grande Portage, which ſince that time has become the principal entrepôt of that trade, and is ſituated in a bay, in latitude 48. north, and longitude 90. weſt. After paſſing the uſual ſeaſon there, they went back to Michilimakinac as before, and encouraged by the trade, returned in increaſed numbers. One of theſe, Thomas Curry, with a ſpirit of enterpriſe ſuperior to that of his contemporaries, determined to penetrate to the furtheſt limits of the French diſcoveries in that country; or at leaſt till the froſt ſhould ſtop him. For this purpoſe he procured guides and interpreters, who were acquainted with the country, and with four canoes arrived at Fort Bourbon, which was one of their poſts, at the weſt end of the Cedar lake, on the waters of the Saſkatchiwine. His riſk and toil were well recompenſed, for he came back the following ſpring with his canoes filled with fine furs, with which he proceeded to Canada, and was ſatisfied never again to return to the Indian country.

"From this period people began to ſpread over every part of the country, particularly where the French had eſtabliſhed ſettlements *."

* *Gen. Hiſt. of the Fur Trade, p. 1.*

After continuing the detail of the hiſtory of the trade for which we muſt refer to the work itſelf, Mr Mackenzie proceeds to inform us of the concern which he himſelf had in it, when in the year 1785, he was aſ- Furr. ſumed as a partner, on condition of going into the Indian country to take an active ſhare in the buſineſs. After ſome ſtruggles, from jealouſy and rivalſhip, with another company who had been ſome time in the trade, a union between the two companies was formed. This happened in 1787, and the following is Mr Mackenzie's account of its ſucceſs, and of the extent and mode of conducting this trade.

"This commercial eſtabliſhment, "he proceeds," was now founded on a more ſolid baſis than any hitherto known in the country; and it not only continued in full force, vigour, and proſperity, in ſpite of all interference from Canada, but maintained at leaſt an equal ſhare of advantage with the Hudſon's Bay Company, notwithſtanding the ſuperiority of their local ſituation. The following account of this ſelf-erected concern will manifeſt the cauſe of its ſucceſs.

"It aſſumed the title of the North-Weſt Company, and was no more than an aſſociation of commercial men, agreeing among themſelves to carry on the fur trade, unconnected with any other buſineſs, though many of the parties engaged had extenſive concerns altogether foreign to it. It may be ſaid to have been ſupported entirely upon credit; for, whether the capital belonged to the proprietor, or was borrowed, it equally bore intereſt, for which the aſſociation was annually accountable. It conſiſted of twenty ſhares, unequally divided among the perſons concerned. Of theſe, a certain proportion was held by the people who managed the buſineſs in Canada, and were ſtyled agents for the Company. Their duty was to import the neceſſary goods from England, ſtore them at their own expence at Montreal, get them made up into the articles ſuited to the trade, pack and forward them, and ſupply the caſh that might be wanting for the outfits; for which they received, independent of the profit on their ſhares, a commiſſion on the amount of the accounts, which they were obliged to make out annually, and keep the adventure of each year diſtinct. Two of them went annually to the Grande Portage, to manage and tranſact the buſineſs there, and on the communication at Detroit, Michilimakinac, St Mary's, and Montreal, where they received ſtores, packed up, and ſhipped the company's furs for England, on which they had alſo a ſmall commiſſion. The remaining ſhares were held by the proprietors, who were obliged to winter and manage the buſineſs of the concern with the Indians, and their reſpective clerks, &c. They were not ſuppoſed to be under any obligation to furniſh capital, or even credit. If they obtained any capital by the trade, it was to remain in the hands of the agents; for which they were allowed intereſt. Some of them, from their long ſervices and influence, held double ſhares, and were allowed to retire from the buſineſs at any period of the exiſting concern, with one of thoſe ſhares, naming any young man in the company's ſervice to ſucceed him in the other. Seniority and merit were, however, conſidered as affording a claim to the ſucceſſion, which, nevertheleſs, could not be diſpoſed of without the concurrence of the majority of the concern; who, at the ſame time relieved the ſeceding perſon from any reſponſibility reſpecting the ſhare that he transferred, and accounted for it according to the annual value or rate of the property; ſo that the ſeller could have no advantage but that of getting the

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the ſhare of ſtock which he retained realiſed, and receiving for the transferred ſhare what was fairly determined to be the worth of it. The former was alſo diſcharged from all duty, and became a dormant partner. Thus, all the young men who were not provided for at the beginning of the contract, ſucceeded in ſucceſſion to the character and advantages of partners. They entered into the company's ſervice for five or ſeven years, under ſuch expectations, and their reaſonable proſpects were ſeldom diſappointed: there were, indeed, inſtances when they ſucceeded to ſhares, before their apprenticeſhip was expired, and it frequently happened that they were provided for while they were in a ſtate of articled clerkſhip. Shares were transferable only to the concern at large, as no perſon could be admitted as a partner who had not ſerved his time to the trade. The dormant partner indeed might diſpoſe of his intereſt to any one he choſe, but if the tranſaction were not ackowledged by his aſſociates, the purchaſer could only be conſidered as his agent or attorney. Every ſhare had a vote, and two-thirds formed a majority. This regular and equitable mode of providing for the clerks of the company, excited a ſpirit of emulation in the diſcharge of their various duties, and in fact, made every agent a principal, who perceived his own proſperity to be immediately connected with that of his employers. Indeed, without ſuch a ſpirit, ſuch a trade could not have become ſo extended and advantageous, as it has been and now is.

"In 1788, the groſs amount of the adventure for the year did not exceed 40,000l.: but by the exertion, enterpriſe, and induſtry of the proprietors, it was brought in eleven years to triple that amount and upwards; yielding proportionate profits, and ſurpaſſing, in ſhort, any thing known in America.

"Such, therefore, being the proſperous ſtate of the company, it, very naturally, tempted others to interfere with the concern in a manner by no means beneficial to the company, and commonly ruinous to the undertakers.

"In 1798 the concern underwent a new form, the ſhares were increaſed to forty-ſix, new partners being admitted, and others retiring. This period was the termination of the company, which was not renewed by all the parties concerned in it, the majority continuing to act upon the old ſtock, and under the old firm; the others beginning a new one; and it now remains to be decided, whether two parties, under the ſame regulations and by the ſame exertions, though unequal in number, can continue to carry on the buſineſs to a ſucceſsful iſſue. The contrary opinion has been held, which, if verified, will make it the intereſt of the parties again to coaleſce: for neither is deficient in capital to ſupport their obſtinacy in a loſing trade, as it is not to be ſuppoſed that either will yield on any other terms than perpetual participation.

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"It will not be ſuperfluous in this place, to explain the general mode of carrying on the fur trade.

"The agents are obliged to order the neceſſary goods from England in the month of October, eighteen months before they can leave Montreal; that is, they are not ſhipped from London until the ſpring following, when they arrive in Canada in the ſummer. In the courſe of the following winter they are made up into ſuch articles as are required for the ſavages; they are then packed into parcels of ninety pounds weight each, but cannot be ſent from Montreal until the May following; ſo that they do not get to market until the enſuing winter, when they are exchanged for furs, which come to Montreal the next fall, and from thence are ſhipped, chiefly to London, where they are not ſold or paid for before the ſucceeding ſpring, or even as late as June; which is forty-two months after the goods were ordered in Canada; thirty-ſix after they had been ſhipped from England; and twenty-four after they had been forwarded from Montreal; ſo that the merchant, allowing that he has twelve months credit, does not receive a return to pay for thoſe goods, and the neceſſary expences attending them, which is about equal to the value of the goods themſelves, till two years after they are conſidered as caſh, which makes this a very heavy buſineſs. There is even a ſmall proportion of it that requires twelve months longer to bring round the payment, owing to the immenſe diſtance it is carried, and from the ſhortneſs of the ſeaſons, which prevent the furs, even after they are collected, from coming out of the country for that period (A).

"The articles neceſſary for this trade, are coarſe woollen cloths of different kinds; milled blankets of different ſizes; arms and ammunition; twiſt and carrot tobacco; Manchester goods; linens, and coarſe ſheetings; thread, lines, and twine; common hardware; cutlery and ironmongery of ſeveral deſcriptions; kettles of braſs and copper, and ſheet-iron; ſilk and cotton handkerchiefs; hats, ſhoes, and hoſe; calicoes and printed cottons, &c. &c. &c. Spirituous liquors and proviſions are purchaſed in Canada. Theſe, and the expence of tranſport to and from the Indian country, including wages to clerks, interpreters, guides, and canoe-men, with the expence of making up the goods for the

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(A) "This will be better illuſtrated by the following ſtatement:

We will ſuppoſe the goods for 1798;

The orders for the goods are ſent to this country	25th Oct. 1796.
They are ſhipped from London	March 1797.
They arrive in Montreal	June 1797.
They are made up in the courſe of that ſummer and winter.	
They are ſent from Montreal	May 1798.
They arrive in the Indian country, and are exchanged for furs the following winter	1798-9.
Which furs come to Montreal	Sept. 1799.
And are ſhipped for London, where they are ſold in March and April, and paid for in May or June	1800.

Furr. the market, form about half the annual amount againſt the adventure.

" This expenditure in Canada ultimately tends to the encouragement of Britiſh manufactory, for thoſe who are employed in the different branches of this buſineſs, are enabled by their gains to purchaſe ſuch Britiſh articles as they muſt otherwiſe forego.

" The produce of the year of which I am now ſpeaking, conſiſted of the following furs and peltries:

106,000 Beaver ſkins,	6000 Lynx ſkins,
2100 Bear ſkins,	600 Wolverine ſkins,
1500 Fox ſkins,	1650 Fiſher ſkins,
4000 Kitt fox ſkins,	100 Rackoon ſkins,
4600 Otter ſkins,	3800 Wolf ſkins,
17,000 Muſquaſh ſkins,	700 Elk ſkins,
32,000 Marten ſkins,	750 Deer ſkins,
1800 Mink ſkins,	1200 Deer ſkins dreſſed,

500 Buffalo robes, and a quantity of caſtoreum.

" Of theſe were diverted from the Britiſh market, being ſent through the United States to China, 13,364 ſkins, fine beaver, weighing 19,283 pounds; 1250 fine otters, and 1724 kitt foxes. They would have found their way to the China market at any rate, but this deviation from the Britiſh channel aroſe from the following circumſtance:

" An adventure of this kind was undertaken by a reſpectable houſe in London, half concerned with the North-Weſt Company in the year 1792. The furs were of the beſt kind, and ſuitable to the market; and the adventurers continued this connexion for five ſucceſſive years, to the annual amount of 40,000l. At the winding up of the concern of 1792, 1793, 1794, 1795, in the year 1797, (the adventure of 1796 not being included, as the furs were not ſent to China, but diſpoſed of in London), the North-Weſt Company experienced a loſs of upwards of 40,000l. (their half,) which was principally owing to the difficulty of getting home the produce procured in return for the furs from China, in the Eaſt India Company's ſhips, together with the duty payable, and the various reſtrictions of that company. Whereas, from America there are no impediments; they get immediately to market, and the produce of them is brought back, and perhaps ſold in the courſe of twelve months. From ſuch advantages the furs of Canada will no doubt find their way to China by America, which would not be the caſe if Britiſh ſubjects had the ſame privileges that are allowed to foreigners, as London would then be found the beſt and ſafeſt market.

" But to return to our principal ſubject.—We ſhall now proceed to conſider the number of men employed in the concern: viz. 50 clerks, 71 interpreters and clerks, 1120 canoe men, and 35 guides. Of theſe, five clerks, 18 guides, and 350 canoe men, were employed for the ſummer ſeaſon in going from Montreal to the Grande Portage, in canoes, part of whom proceeded from thence to Rainy Lake, as will be hereafter explained, and are called *pork-eaters*, or *goers* and *comers*. Theſe were hired in Canada or Montreal, and were abſent from the 1ſt of May till the latter end of September. For this trip the guides had from 800 to 1000 livres, and a ſuitable equipment; the foreman and ſteerſman from 400 to 600 livres; the middle men from 250 to 350 livres, with an equipment of one blanket, one ſhirt, and one pair of trowſers; and were maintained during that period at the expence of their employers. Independent of their wages, they were allowed to traffic, and many of them earned to the amount of their wages. About one-third of theſe went to winter, and had more than double the above wages, and equipment. All the others were hired by the year, and ſome times for three years; and of the clerks many were apprentices, who were generally engaged for five or ſeven years, for which they had only 100l. proviſion and clothing. Such of them who could not be provided for as partners, at the expiration of this time, were allowed from 100l. to 300l. per annum, with all neceſſaries, till proviſion was made for them. Thoſe who acted in the twofold capacity of clerk and interpreter, or were ſo denominated, had no other expectation than the payment of wages to the amount from 1000 to 4000 livres per annum, with clothing and proviſions. The guides, who are a very uſeful ſet of men, acted alſo in the additional capacity of interpreters, and had a ſtated quantity of goods, conſidered as ſufficient for their wants, their wages being from 1000 to 3000 livres. The canoe men are of two deſcriptions, foremen and ſteerſmen, and middlemen. The two firſt were allowed annually 1200, and the latter 400, livres each. The firſt claſs had what is called an equipment, conſiſting of two blankets, two ſhirts, two pair of trowſers, two handkerchiefs, 14 pounds of tobacco, and ſome trifling articles. The latter had 10 pounds of tobacco, and all the other articles: thoſe are called *north men*, or *winterers;* and to the laſt claſs of people were attached upwards of 700 Indian women and children, victualled at the expence of the company.

Furr || Furthcoming.

" The firſt claſs of people are hired in Montreal five months before they ſet out, and receive their equipments, and one-third of their wages in advance; and an adequate idea of the labour they undergo may be formed from the following account of the country through which they paſs, and their manner of proceeding.

" The neceſſary number of canoes being purchaſed, at about 300 livres each, the goods formed into packages, and the lakes and rivers free of ice, which they uſually are in the beginning of May, they are then diſpatched from La Chine, eight miles above Montreal, with eight or ten men in each canoe, and their baggage; and 65 packages of goods, 600 weight of biſcuit, 200 weight of pork, three buſhels of peaſe, for the men's proviſion; two oil cloths to cover the goods, a ſail, &c. an axe, a towing-line, a kettle, and a ſponge to bail out the water, with a quantity of gum, bark, and watape, to repair the veſſel. An European on ſeeing one of theſe ſlender veſſels thus laden, heaped up, and ſunk with her gunwale within ſix inches of the water, would think his fate inevitable in ſuch a boat, when he reflected on the nature of her voyage; but the Canadians are ſo expert that few accidents happen* "

* *Gen. Hiſt. of the Fur Trade*, p. 20.

FURSTENBURGH, a town and caſtle of Germany, the capital of a county of the ſame name, 30 miles north-weſt of Conſtance. E. Long. 8. 27. N. Lat. 47. 57.

FURTHCOMING, in *Law*, the name of an action competent

Furr ‖ Fuſiliers.

competent to any perſon who has uſed arreſtment in the hands of his debtor's creditor, for having the ſubject arreſted declared his property.

FURUNCLE, or BOIL, in *Surgery*, a ſmall reſiſting tumour, with inflammation, redneſs, and great pain, ariſing in the adipoſe membrane, under the ſkin. See SURGERY *Index*.

FURZE. See ULEX, BOTANY *Index*.

FUSANUS, in *Botany*, a genus of plants belonging to the polygamia claſs. The hermaphrodite calyx is quinquefid; there is no corolla; there are four ſtamina; the germen beneath; there are four ſtigmata; the fruit a plum.

FUSAROLE, in *Architecture*, a moulding or ornament placed immediately under the echinus, in the Doric, Ionic, and Compoſite capitals.

FUSE or FUZE, in artillery. See FUSEE.

FUSEE, in clock-work, is that conical part drawn by the ſpring, and about which the chain or ſtring is wound; for the uſe of which, ſee CLOCK and WATCH.

FUSEE, or *Firelock*. See MUSQUET.

FUSEE, *Fuze*, or *Fuſe*, of a bomb or grenado, is that which makes the whole powder or compoſition in the ſhell take fire, to do the deſigned execution.

Fuzes are chiefly made of very dry beech wood, and ſometimes of hornbeam, taken near the root. They are turned rough, and bored at firſt, and then kept for ſeveral years in a dry place; the diameter of the hole is about one-fourth of an inch; the hole does not come quite through, leaving about one-fourth of an inch at the bottom; and the head is made hollow, in the form of a bowl.

The compoſition for fuzes is ſaltpetre 3, ſulphur 1, and mealed powder 3, 4, and ſometimes 5. This compoſition is driven in with an iron driver (whoſe ends are capped with copper to prevent the compoſition from taking fire), and equally hard as poſſible; the laſt ſhovelfull being all mealed powder, and two ſtands of quickmatch laid acroſs each other being driven in with it, the ends of which are folded up into the hollow top, and a cap of parchment tied over it till uſed.

When theſe fuzes are driven into the loaded ſhell, the lower end is cut off in a ſlope, ſo that the compoſition may inflame the powder in the ſhell: the fuze muſt have ſuch a length as to continue burning all the time the ſhell is in its range, and to ſet fire to the powder as ſoon as it touches the ground, which inſtantly burſts into many pieces. When the diſtance of the battery from the object is known, the time of the ſhell's flight may be computed to a ſecond or two; which being known, the fuze may be cut accordingly, by burning two or three, and making uſe of a watch or a ſtring by way of a pendulum to vibrate ſeconds.

FUSIBILITY, in *Natural Philoſophy*, that quality of bodies which renders them fuſible. Gold is more fuſible than iron or copper; but leſs ſo than ſilver, tin, and lead. Borax and other ſubſtances are frequently mixed with metals, to render them more fuſible.

FUSIL, in *Heraldry*, a bearing of a rhomboidal figure, longer than the lozenge, and having its upper and lower angles more acute and ſharp than the other two in the middle. It is called in Latin *fuſus*, "a ſpindle," from its ſhape.

FUSILIERS, FUSILEERS, or *Fuzileers*, in the military art, are ſoldiers armed as the reſt of the infantry, but formerly wore caps like the grenadiers, though ſomewhat ſhorter. There are three regiments in the Britiſh ſervice: the royal regiment of Scotch fuzileers raiſed in 1678; the royal regiment of Engliſh fuzileers raiſed in 1685; and the royal regiment of Welſh fuzileers raiſed in 1688-9.

Fuſiliers ‖ Fuſtian.

FUSION, the ſtate of a body rendered fluid by fire. See FLUIDITY, and CHEMISTRY *Index*.

FUST, or FAUST, JOHN, was a goldſmith of Mentz, and one of the three artiſts to whom the valuable invention of printing has been uſually aſcribed. The names of the other two were Guttemberg and Schœffer. It ſeems impoſſible, however, to determine with certainty, whether Fuſt had any other merit in the buſineſs than that of ſupplying Guttemberg with money, who had been making ſome attempts with carved blocks at Straſburgh, before he viſited Mentz. To Schœffer, the ſon-in-law of Fuſt, we are indebted for the invention of punches and matrices, by means of which this noble art was afterwards carried to perfection. That work which may be regarded as the origin of the true typographic art, was the "Durandi Rationale Divinorum Officiorum," publiſhed in 1459, by Fuſt and Schœffer, which was ſoon followed by a copy of the bible, both executed in a very maſterly manner.

We are informed that Fuſt went to Paris in 1462, in order to diſpoſe of a part of the ſecond edition of his bible, which he was enabled to ſell conſiderably lower than bibles in manuſcript, yet ſome reckoned themſelves overcharged by him, and ſome pretend that he was even accuſed of magic, but for the belief of this there appears to be no rational foundation. It ſeems certain that Fuſt was never in Paris after the year 1466; but that he was in that metropolis then, is proved by a note at the end of a copy of Cicero's Offices, intimating that the firſt poſſeſſor received it from John Fuſt at Paris, in 1466. It is extremely probable that he died that year of the plague, to which 40,000 of the inhabitants fell a ſacrifice in the months of Auguſt and September. This opinion is farther corroborated by this circumſtance, that the name of Schœffer alone was prefixed to the books which were publiſhed at Mentz after that period.

This man has been frequently confounded with John Fauſt, better known by the name of Dr Fauſtus, a pretender to the art of magic, who was firſt a theologian, then a ſtudent of medicine, and laſt of all ſold himſelf to the devil for 24 years, at the expiration of which period it ſeems the devil came to carry off his purchaſe, and daſhed out the doctor's brains againſt the wall about mid-night. This wretched romance has no doubt been invented by the monks, to blacken the reputation of the great Fuſt, whoſe art deprived them of the emoluments ariſing from the copying of manuſcripts. See (Hiſtory of) PRINTING.

FUST, in *Architecture*, the ſhaft of a column, or the part comprehended between the baſe and the capital, called alſo the naked.

FUSTIAN, in *Commerce*, a kind of cotton ſtuff, which ſeems as it were whaled on one ſide.

Right fuſtians ſhould be altogether made of cotton-yarn, both woof and warp; but a great many are made, the warp of which is flax, or even hemp.

There are fuſtians made of ſeveral kinds, wide, narrow, fine, coarſe; with ſhag or nap, and without it.

Fuſtian || Fuſtigatio.

FUSTIAN is alſo uſed for a bombaſt ſtyle, or a high ſwelling kind of writing, made up of heterogeneous parts.

FUSTICK, or FUSTOCK, a yellow wood, that grows in all the Caribbee iſlands, and is uſed in dyeing yellow. It is a ſpecies of MORUS. See BOTANY *Index*. And for its properties, ſee CHEMISTRY and DYEING *Index*.

FUSTIGATIO, in the Roman cuſtoms, a puniſhment inflicted by beating with a cudgel. This puniſhment was peculiar to freemen; for the ſlaves were ſcourged or laſhed with whips.

Futtocks || Fuzileers.

FUTTOCKS, in a ſhip, the timbers raiſed over the keel, or the encompaſſing timbers that make her breadth.

FUTURE, ſomething to come hereafter. We ſay, a *future* ſtate, a *future* contingency; there is none but God to whom *future* things are preſent.

FUTURE, or *FUTURE Tenſe*, in *Grammar*, denotes an inflection of verbs, whereby they denote, that a thing will be in ſome time yet to come. See GRAMMAR.

FUZES, or FUSEES, in artillery. See FUSEE.

FUZILEERS. See FUSILEERS.

G.

G. G, THE ſeventh letter and fifth conſonant of our alphabet; though in the alphabets of all the oriental languages, the Hebrew, Phenician, Chaldee, Syriac, Samaritan, Arabic, and even Greek, *G* is the third letter. The Hebrews call it *ghimel* or *gimel*, q. d. "camel;" by reaſon it reſembles the neck of that animal; and the ſame appellation it bears in the Samaritan, Phenician, and the Chaldee: in the Syriac it is called *gamel*, in Arabic *giim*, and in Greek *gamma*.

The gamma (Γ) of the Greeks is manifeſtly the gimel (ג) of the Hebrews or Samaritans. All the difference between the gamma and gimel conſiſts in this, that the one is turned to the right, and the other to the left, according to the different manners of writing and reading which obtained among thoſe different nations; ſo that all the pains Salmaſius has taken on Solinus, to prove that the G was derived from the Greek kappa, is loſt.

From the Greeks the Latins borrowed their form of this letter; the Latin G being certainly a corruption of the Greek gamma Γ, as might eaſily be ſhown had our printers all the characters and forms of this letter which we meet with in the Greek and Latin MSS. through which the letter paſſed from Γ to G.

Diomed, lib. ii. cap. *De Litera*, calls G a new letter. His reaſon is, that the Romans had not introduced it before the firſt Punic war; as appears from the roſtral column erected by C. Duilius, on which we everywhere find a C in lieu of G. It was Sp. Carvilius who firſt diſtinguiſhed between thoſe two letters, and invented the figure of the G; as we are aſſured by Terentius Scaurus. The C ſerved very well for G; it being the third letter of the Latin alphabet, as the Γ or γ was of the Greek.

The G is found inſtead of C on ſeveral medals: *Vaillant, Num. Imperat.* tom. i. p. 39.

M. Beger produces a medal of the *Familia Ogulnia*, where GAR is read inſtead of CAR, which is on thoſe of M. Patin. But the C is more frequently ſeen on medals in lieu of G; as, AUCUSTALIS CALLAECIA CARTACINENSIS, &c. for AUGUSTALIS, &c. Not that the pronunciation of thoſe words was altered, but only that the G was unartfully or negligently cut by the workmen: as is the caſe in divers inſcriptions of the eaſtern empire; where AVC, AUCC, AUCCC, are frequently found for AUG, &c. G.

The northern people frequently change the G into V or W; as in *Gallus, Wallus; Gallia, Wallia, Vallia*, &c. For in this inſtance, it muſt not be ſaid that the French have changed the W into G; becauſe they wrote *Gallus* long before *Wallus* or *Wallia* was known, as appears from all the ancient Roman and Greek writers. And yet it is equally true, that the French change the W of the northern nations, and V conſonant, into G; as, *Willielmus*, "William," into *Guillaume; Wulphilas* into *Gulphilas; Vaſcon* into *Gaſcon*, &c.

The letter G is of the mute kind, and cannot be any way ſounded without the help of a vowel. It is formed by the reflection of the air againſt the palate, made by the tongue as the air paſſes out of the throat; which Martianus Capella expreſſes thus, G *ſpiritus cum palato*; ſo that G is a palatal letter.

The modern G takes its form from that of the Latins. In Engliſh it has two ſounds, one from the Greek Γ and the Latin, which is called that of the hard *G*, becauſe it is formed by a preſſure ſomewhat hard on the fore part of the tongue againſt the upper gum; which ſound it retains before *a, o, u, l, r*; as *gate, go, gull*. At the end of a word it is always hard, as *ring, ſing*, &c. The other ſound, called that of the ſoft *G*, reſembles that of *j*; and is commonly, though not always, found before *e* and *i*, as in *geſture, giant*, &c. To this rule, however, there are many exceptions; *G* is often hard before *i*, as *give*, &c. and ſometimes before *e*, as *get*, &c. It is alſo hard in derivatives from words ending in *g*, as *ſinging, ſtronger*, &c. and generally before *er*, at the ends of words, as *finger*. *G* is mute before *n*, as *gnaſh, ſign*. *Gh* has the ſound of the hard *G* in the beginning of a word, as *ghoſtly*; in the middle, and ſometimes at the end, it is quite ſilent, as *right, though*. At the end of a word *Gh* has often the ſound of *f*, as *laugh, rough, tough*.

As a numeral, G was anciently uſed to denote 400; and with a daſh over it thus $\overline{G}$, 40,000.

As an abbreviature, G. ſtands for *Gaius, Gellius, gens*,

G ‖ Gabii.

gens, *genius*, &c. G. G. for *gemina*, *geſſit*, *geſſerunt*, &c. G. C. for *genio civitatis* or *Cæſaris*. G. L. for *Gaius libertus*, or *genio loci*. G. V. S. for *genio urbis ſacrum*. G. B. for *genio bono*. And G. T. for *genio tutelari*.

In muſic, G is the character or mark of the treble cleff; and from its being placed at the head, or marking the firſt ſound in Guido's ſcale, the whole ſcale took the name of *gamut*.

GABALE, in *Mythology*, a deity worſhipped at Heliopolis under the figure of a lion, with a radiant head; and it is thus repreſented on many medals of Caracalla.

GABARDINE, from the Italian *gavardina*, has been ſometimes uſed to denote a coarſe frock, or mean dreſs. In this ſenſe it is uſed by Shakeſpeare in his Tempeſt and Merchant of Venice, and by Butler in his Hudibras, book i.

GABARA, or GABBARA, in antiquity, the dead bodies which the Egyptians embalmed, and kept in their houſes, eſpecially thoſe of ſuch of their friends as died with the reputation of great piety and holineſs, or as martyrs. See EMBALMING, and MUMMY.

GABEL, (*Gabella*, *Gablum*, *Gablagium*), in French *Gabelle*, i. e. *Vectigal*, hath the ſame ſignification among the ancient Engliſh writers that *gabelle* hath in France. It is a tax; but hath been variouſly uſed, as for a rent, cuſtom, ſervice, &c. And where it was a payment of rent, thoſe who paid it were termed *gablatores*. When the word *gabel* was formerly mentioned without any addition to it, it ſignified the tax on ſalt, though afterwards it was applied to all other taxes.

In the French cuſtoms, the gabel, or tax on ſalt, computed to make one-fourth of the whole revenue of the kingdom, is ſaid to have had its riſe in France in 1286, under Philip the Fair. Philip the Long took a double per livre on ſalt, by an edict in 1318, which he promiſed to remit when he was delivered from his enemies; which was renewed by Philip de Valois in 1345; and the duty was raiſed to four deniers per livre; King John reſumed it in 1355, and it was granted to the dauphin in 1358, to ranſom King John. It was continued by Charles V. in 1366; after his deceaſe it was ſuppreſſed, but revived again by Charles VI. in 1381. Louis XI. raiſed it to 12 deniers per livre; and Francis I. in 1542 to 24 livres per muid: and it has been conſiderably augmented ſince that time; ſo that a minot of ſalt latterly paid a duty of 52 livres 8 ſols and 6 deniers. Philip de Valois firſt eſtabliſhed granaries and officers of the gabelles, and prohibited any other perſons from ſelling ſalt: from which time the whole commerce of ſalt for the inland conſumption continued wholly in the king's hands, every grain thereof being ſold and diſtributed by his farmers and officers created for the purpoſe.—This oppreſſive tax was aboliſhed by the National Aſſembly.

GABII, in *Ancient Geography*, a town of Latium, midway almoſt between Rome and Preneſte to the eaſt, often mentioned in the hiſtory of Tarquin the Proud. *Cinctus Gabinus* denoted a particular way of tucking the gown, by drawing it forwards on the breaſt, and tying it into a knot; as the people of Gabii did at a ſolemn ſacrifice, on the ſudden attack of an enemy, in order to be fitter for action. In this manner the conſul uſed to declare war, to ſacrifice, and burn the ſpoils of the enemy; and then he was ſaid to be *præcinctus*. The place now extinct. Gabii ‖ Gabres.

GABINIAN LAWS, in Roman antiquities; laws inſtituted upon ſeveral occaſions by perſons of the name of *Gabinius*. The firſt was the *Gabinia lex de Comitiis*, by A. Gabinius the tribune, in the year of Rome 614. It required, that in the public aſſemblies for electing magiſtrates, the votes ſhould be given by tablets, and not *viva voce*.—Another *de Comitiis*, which made it a capital puniſhment to convene any clandeſtine aſſembly, agreeable to the old law of the 12 tables. Another *de Militia*, by A. Gabinius the tribune, year of Rome 685. It granted Pompey the power of carrying on the war againſt the pirates, during three years, and of obliging all kings, governors, and ſtates, to ſupply him with all the neceſſaries he wanted, over all the Mediterranean ſea, and in the maritime provinces as far as 400 *ſtadia* from the ſea.—Another *de Uſura* by Aul. Gabinius the tribune, year of Rome 685. It ordained that no action ſhould be granted for the recovery of any money borrowed upon ſmall intereſt to be lent upon larger. This was an uſual practice at Rome, which obtained the name of *verſuram facere*.—Another againſt fornication.

GABIONS, in *Fortification*, baſkets made of ozier twigs, of a cylindrical form, ſix feet high and four wide; which, being filled with earth, ſerve as a ſhelter from the enemy's fire.

GABLE or *GABEL End*, of a houſe (from *gaval*, Welſh), is the upright triangular end from the cornice or eaves to the top of the houſe.

GABRES, or GAVRES, a religious ſect in Perſia and India; called alſo *Gebres*, *Guebres*, *Gevres*, *Gaurs*, &c. See MAGI.

The Turks call the Chriſtians *Gabres*, q. d. Infidels, or people of a falſe religion; or rather, as Leunclavius obſerves, Heathens or Gentiles: the word *Gabre*, among the Turks, having the ſame ſignification as *Pagan* or *Infidel* among the Chriſtians, and denoting any thing not Mahometan.

In Perſia the word has a more peculiar ſignification; wherein it is applied to a ſect diſperſed through the country, and ſaid to be the remains of the ancient Perſians or followers of Zoroaſter, being worſhippers of fire. They have a ſuburb at Iſpahan, which is called *Gaurabad*, or "the town of the *Gaurs*," where they are employed in the meaneſt and vileſt drudgery; ſome of them are diſperſed through other parts of Perſia; but they principally abound in Kerman, the moſt barren province in the whole country, where the Mahometans allow them liberty and the exerciſe of their religion. Several of them fled many ages ago into India, and ſettled about Surat, where their poſterity remain to this day. There is alſo a colony of them at Bombay. They are a poor, ignorant, inoffenſive people, extremely ſuperſtitious, and zealous for their rights, rigorous in their morals, and honeſt in their dealings. They profeſs to believe a reſurrection and a future judgment, and to worſhip only one God. And though they perform their worſhip before fire, and direct their devotion towards the riſing ſun, for which they have an extraordinary veneration, yet they ſtrenuouſly maintain that they worſhip neither; but that theſe are the moſt expreſſive ſymbols of the Deity, and that for this reaſon they turn towards them in their devotional ſer-

Gabres || Gad.

vices.—However, ſome have ſuppoſed, that theſe are Perſians converted to Chriſtianity, who, being afterwards left to themſelves, mingled their ancient ſuperſtitions with the truths and practices of Chriſtianity, and ſo formed for themſelves a religion apart: and they allege, that throughout the whole of their ſyſtem of doctrine and practice, we may diſcern the marks and traces of Chriſtianity, though grievouſly defaced; the annunciation, the magi, the maſſacre of the infants, our Saviour's miracles, his perſecutions, aſcenſion, &c.

GABRIEL, the name of one of the principal angels in heaven. It ſignifies *the ſtrength of God*. There are a few events, in which this exalted being was concerned, recorded in Scripture. He was ſent to the prophet Daniel, to explain to him the viſion of the ram and goat, and the myſtery of the ſeventy weeks, which had been revealed to him. He was ſent to Zecharias, to declare to him the future birth of John the Baptiſt. Six months after, he was ſent to Nazareth to the Virgin Mary, to warn her of the birth of Jeſus Chriſt.

The Orientaliſts add ſeveral particulars to what the Scriptures inform us concerning the angel Gabriel. The Mahometans call him the *faithful ſpirit*; and the Perſians, by way of metaphor, the *peacock of heaven*. We read, in the ſecond chapter of the Koran, that *whoſoever is an enemy to Gabriel ſhall be confounded*. It was Gabriel, they believe, who brought to Mahomet their falſe prophet the revelations which he publiſhed; and it was he who conducted him to heaven mounted upon the animal Borak.

GABRIEL, *St*, an iſland lying in the great river La Plata, South America, which was diſcovered by the celebrated navigator Sebaſtian Cabot, in the year 1526.

GABRIELITES, in eccleſiaſtical hiſtory, a ſect of Anabaptiſts that appeared in Pomerania in 1530. They derive their name from Gabriel Scherling; who, after having been for ſome time tolerated in that country, was obliged to remove, and died in Poland.

GAD, a Jewiſh prophet, the ſeer, or domeſtic prophet of King David, and his adviſer in all matters of importance. When the diſpleaſure of the Almighty was rouſed againſt David and the children of Iſrael for numbering the people, Gad received a commiſſion to wait upon the king, and make him an offer of three evils as a puniſhment for his offence. Theſe were famine, war, or peſtilence, the laſt of which was choſen by David, the ravages of which were terrible beyond deſcription, and produced genuine repentance in the hearts of ſurvivors. To perpetuate the memory of this event, Gad ordered an altar to be erected in the threſhing-floor of Ornan the Jebuſite, around which place, it is ſaid, the temple was afterwards built. We learn from the Old Teſtament that Gad was an author, who wrote a hiſtory of his own times, of which much uſe appears to have been made by the compilers of the books of Samuel and Chronicles. Gad was alſo the the name of one of the twelve patriarchs, or ſons of Jacob.

GAD, in *Ancient Geography*, a diſtrict of the Tranſjordan Paleſtine, ſituated between Gilead and the kingdom of Baſhan to the north, and the kingdom of the Amorites, to the ſouth; having the Jordan to the weſt, and bounded by various peoples on the eaſt; ſo called from a tribe of that name.

Gad || Gaffarel.

GAD, among miners, a ſmall punch of iron, with a long wooden handle, uſed to break up the ore.

One of the miners holds this in his hand, directing the point to a proper place, while the other drives it into the vein, by ſtriking it with a ſledge hammer.

GAD-Bee, or *Gad-Fly*. See OESTRUS, ENTOMOLOGY *Index*.

GADARA, in *Ancient Geography*, a town of the Peræa, or Transjordan, in the Decapolis, a very ſtrong place. Reſtored by Pompey after its demolition by the Jews (Joſephus). After Herod's death it was joined to the province of Syria by Auguſtus.

GADARENORUM AGER, in *Ancient Geography*, the country of the Gadarenes, called by Matthew the country of the Gergeſenes, becauſe it was a diſtrict that lay between Gadara and Gergeſa, otherwiſe called *Geraſa*, both which lay within the Decapolis on the other ſide Jordan.

GADES, or GADIRA, in *Ancient Geography*, a ſmall iſland in the Atlantic, on the Spaniſh coaſt, 25 miles from the Columns of Hercules. It was ſometimes called *Tarteſſus* and *Erythia* according to Pliny. Geryon, whom Hercules killed, fixed his reſidence there. Hercules, ſurnamed Gaditanus, had there a celebrated temple in which all his labours were engraved with excellent workmanſhip. The inhabitants are called Gaditani.

GADUS, a genus of fiſhes belonging to the order of jugulares. This genus includes the cod, the whiting, the torſk, &c. See ICHTHYOLOGY *Index*

GAELIC LANGUAGE. See HIGHLANDS.

GÆTULIA, in *Ancient Geography*, a country of Africa, lying to the ſouth of Mauritania, called *Gætulia Propria*, and *Vetus*. *Gætuli*, the people, were diſtinguiſhed by different epithets; as *Nigri*, *Autololes*, *Daræ* and *Baniuræ*, (Pliny). The *Gætuli* were among the firſt inhabitants of Africa; a rough, unpoliſhed people, living on veniſon and the ſpontaneous productions of the earth; a roving, wandering people, who took up with the firſt place in which night ſurpriſed them, (Salluſt).

GAFF, a ſort of boom or pole, frequently uſed in ſmall ſhips, to extend the upper edge of the mizen; and always employed for the ſame purpoſe on thoſe ſails whoſe foremoſt edges are joined to the maſt by hoops or lacings, and which are uſually extended by a boom below. Such are the main ſails of all ſloops, brigs, and ſchooners.

GAFFAREL, JAMES, a French divine, and very learned writer, born about 1601. He acquired great ſkill in the oriental and ſeveral other languages; and was particularly verſant in the cabbaliſtic and occult ſciences, which he learned, expoſed, and refuted. Cardinal Richelieu made choice of him for his library keeper, and ſent him into Italy to collect the beſt manuſcripts and books. He publiſhed a book entitled *Curioſitez Inouies*, i. e. Unheard-of Curioſities. It is ſaid the cardinal deſigned to employ him in his grand project for the reunion of religions. He died in 1681, aged 80. He had been labouring for many years, and had almoſt finiſhed a hiſtory of the ſubterranean world; containing an account of the caves, grottoes, vaults, catacombs,

Gaffarel || Gage.

catacombs, and mines, he had met with in 30 years travels.

GAGATES, or JET. See JET, MINERALOGY *Index*.

GAGE, in our ancient cuſtoms, ſignifies a pledge or pawn, given by way of ſecurity. The word is only properly uſed in ſpeaking of moveables; for immoveables, *hypotheca* is uſed.

If the gage periſh, the perſon who received it is not to anſwer for it, but only for extreme negligence, &c.

GAGE is alſo uſed for a challenge to combat: (See CARTEL). In which ſenſe, it was a pledge, which the accuſer or challenger caſt on the ground, and the other took up as accepting the challenge; it was uſually a glove, gauntlet, chaperoon, or the like. See COMBAT, and DUEL.

GAGE, is only now retained as a ſubſtantive. As a verb, the *G* is changed into *W*, and of *gage* is formed *wage:* as to wage law, to wage deliverance, q. d. to give ſecurity a thing ſhall be delivered. See WAGE.

If a perſon who has diſtrained be ſued for not having delivered what he had taken by diſtreſs, he ſhould wage, or gage, or gager, deliverance; that is, put in ſurety that he will deliver them.

Mort-GAGE, is that which is left in the hands of the proprietor, ſo that he reaps the fruits thereof.

In oppoſition to *vif-gage*, where the fruits or revenues are reaped by the creditor, and reckoned on the foot of the debt, which diminiſhes in proportion thereto. The ſecond acquits or diſcharges itſelf; the firſt does not.

GAGE, in the ſea language. When one ſhip is to windward of another, ſhe is ſaid to have the weather-gage of her. They likewiſe call the number of feet that a veſſel ſinks in the water, the ſhip's *gage;* this they find by driving a nail into a pike near the end, and putting it down beſide the rudder till the nail catch hold under it; then as many feet as the pike is under water is the ſhip's gage.

GAGE, among letter founders, a piece of box, or other hard wood, variouſly notched; the uſe of which is to adjuſt the dimenſions, ſlopes &c. of the different ſorts of letters. See FOUNDERY.

GAGE, in joinery, is an inſtrument made to ſtrike a line truly parallel to the ſtraight ſide of any board or piece of ſtuff. Its chief uſe is for gaging of tenons true, to fit into mortiſes; and for gaging ſtuff of an equal thickneſs. It is made of an oval piece of wood, fitted upon a ſquare ſtick, to ſlide up and down ſtiffly thereon, and with a tooth at the end of a ſtaff, to ſcore, to ſtrike a line upon the ſtaff at any diſtance, according to the diſtance of the oval from it.

Sliding GAGE, a tool uſed by the mathematical inſtrument makers for meaſuring and ſetting off the diſtances.

Sea GAGE, an inſtrument invented by Dr Hales and Dr Deſaguliers for finding the depth of the ſea; the deſcription whereof is this. AB (fig. 1.) is the gage bottle, in which is cemented the gage tube *Ff* in the braſs cape at G. The upper end of tube F is hermetically ſealed, and the open lower end *f* is immerſed in mercury, marked C, on which ſwims a ſmall thickneſs or ſurface of treacle. On the top of the bottle is ſcrewed a tube of braſs HG, pierced with ſeveral holes to admit the water into the bottle AB. The body K is a weight hanging by its ſhank L, in a ſocket N, with a notch on one ſide at *m*, in which is fixed the catch *l* of the ſpring S, and paſſing through the hole, L, in the ſhank of the weight K, prevents its falling out when once hung on. On the top, in the upper part of the braſs tube at H, is fixed a large empty ball, or full blown bladder I, which muſt not be ſo large, but that the weight K may be able to ſink the whole under water.

Plate CXXVIII fig. 1.

Gage.

The inſtrument thus conſtructed is uſed in the following manner. The weight K being hung on, the gage is let fall into deep water, and ſinks to the bottom: the ſocket N is ſomewhat longer than the ſhank L; and therefore, after the weight K comes to the bottom, the gage will continue to deſcend till the lower part of the ſocket ſtrikes againſt the weight; this gives liberty to the catch to fly out of the hole L, and let go the weight K: when this is done, the ball or bladder I inſtantly buoys up the gage to the top of the water. While the gage is under water, the water having free acceſs to the treacle and mercury in the bottle, will by its preſſure force it up into the tube F*f*, and the height to which it has been forced by the greateſt preſſure, viz. that at the bottom, will be ſhown by the mark in the tube which the treacle leaves behind it, and which is the only uſe of the treacle. This ſhows into what ſpace the whole air in the tube F*f* is compreſſed; and conſequently the height or depth of the water which by its weight produced that compreſſion, which is the thing required.

If the gage tube F*f* be of glaſs, a ſcale might be drawn on it with the point of a diamond, ſhowing, by inſpection, what height the water ſtands above the bottom. But the length of 10 inches is not ſufficient for fathoming depths at ſea, ſince that, when all the air in ſuch a length of tube is compreſſed into half an inch, the depth of water is more than 634 feet, which is not half a quarter of a mile.

If, to remedy this, we make uſe of a tube 50 inches long, which for ſtrength may be a muſket barrel, and ſuppoſe the air compreſſed into an hundredth part of half an inch; then by ſaying, as 1 : 99 :: 400 : 39600 inches, or 3300 feet; even this is but little more than half a mile, or 2640 feet. But ſince it is reaſonable to ſuppoſe the cavities of the ſea bear ſome proportion to the mountainous parts of the land, ſome of which are more than three miles above the earth's ſurface; therefore, to explore ſuch great depths, the Doctor contrived a new form for his ſea gage, or rather for the gage tube in it, as follows. BCDF (fig. 2.) is a hollow metalline globe communicating on the top with a long tube AB, whoſe capacity is a ninth part of that globe. On the lower part at D, it has alſo a ſhort tube DE, to ſtand in the mercury and treacle. The air contained in the compound gage tube is compreſſed by the water as before; but the degree of compreſſion, or height to which the treacle has been forced, cannot there be ſeen through the tube: therefore, to anſwer that end, a ſlender rod of metal or wood, with a knob on the top of the tube AB, will receive the mark of the treacle, and ſhow it when taken out.

Fig. 2.

If the tube AB be 50 inches long, and of ſuch a bore

Gage. bore that every inch in length ſhould be a cubic inch of air, and the contents of the globe and tube together 500 cubic inches; then when the air is compreſſed within an hundredth part of the whole, it is evident the treacle will not approach nearer than five inches of the top of the tube, which will agree to the depth of 3300 feet of water as above. Twice this depth will compreſs the air into half that ſpace nearly, viz. $2\frac{1}{2}$ inches, which correſpond to 6600, which is a mile and a quarter. Again, half that ſpace, or $1\frac{1}{4}$ inch, will ſhow double the former depth, viz. 13200 feet, or $2\frac{1}{2}$ miles; which is probably very nearly the greateſt depth of the ſea.

Bucket Sea GAGE, an inſtrument contrived by Dr Hales to find the different degrees of coolneſs and ſaltneſs of the ſea, at different depths: it conſiſts of a common houſehold pail or bucket, with two heads: Theſe heads have each a round hole in the middle, about four inches in diameter, covered with ſquare valves opening upward; and that they may both open and ſhut together, there is a ſmall iron rod fixed to the upper part of the lower valve, and the other end to the lower ſide of the upper valve. So that as the bucket deſcends with its ſinking weight into the ſea, both the valves may open by the force of the water, which by that means has a free paſſage through the bucket. But when the bucket is drawn up, then both the valves ſhut by the force of the water at the upper part of the bucket; ſo that the bucket is drawn up full of the loweſt ſea water to which it has deſcended. When the bucket is drawn up, the mercurial thermometer fixed in it is examined; but great care muſt be taken to obſerve the degree at which the mercury ſtands, before the lower part of the thermometer is taken out of the water in the bucket, leſt it be affected by the different temperature of the air. In order to keep the bucket in a right poſition, there are four cords fixed to it, reaching about three feet below it; to which the ſinking weight is fixed. The reſult of ſeveral trials with this gage was, that when it was let down to different depths, from 360 feet to 5346 feet, in lat. 25. 13. N. and long. 25. 12. W. it was diſcovered by the thermometer, that the cold increaſed gradually in proportion to the depths, till it deſcended to 3900 feet, viz. near $\frac{1}{4}$ths of a mile, whence the mercury in the thermometer came up at 53°; and though it was afterwards ſunk to 5346 feet, i. e. a mile and 66 feet, it came up no lower: the warmth of the water upon the ſurface, and that of the air, was all that time 84°. When the water in the bucket was become of the ſame temperature with that on the ſurface of the ſea, equal quantities of both were weighed and tried by the hydrometer; that from below was found to be the heavieſt, and conſequently the ſalteſt.

Dr Hales was probably led to the conſtruction of this ſea gage from an inſtrument invented by Dr Hook, and deſigned for the ſame purpoſe. This conſiſts of a
Fig. 3. ſquare wooden bucket C, (fig. 3.) whoſe bottoms are ſo contrived, that as the weight of A ſinks the iron B, to which the bucket C is faſtened by two handles D, D, on the end of which are the moveable bottoms or valves EE, and thereby draws down the bucket, the reſiſtance of the water keeps up the bucket in the poſture C, whereby the water, whilſt the bucket was deſcending, hath a free paſſage through it; whereas, as ſoon as the bucket is pulled upwards by the line F, the reſiſtance of the water to that motion beats the bucket downwards, and keeps in the poſture G, whereby the included water is kept from getting out, and the ambient water kept from getting in. Phil. Tranſ. N° ix. p. 149. and N° xxiv. p. 447. or Abr. vol. ii. p. 260. Gage.

Aquco-mercurial GAGE, is the name of an apparatus contrived by Dr Hales, and applied in various forms to the branches of trees, in order to determine the force with which they imbibe moiſture. Let *e r*, (fig. 4.) be a cylindric glaſs, e. gr. of an inch diameter within, and eight inches long. Into this glaſs is introduced the branch of a young thriving apple tree *b*, about three feet long, with lateral branches; the diameter of the tranſverſe cut *i* being $\frac{3}{4}$ths of an inch. Having fitted the joint *r* to the tube at *r*, by folding a piece of ſheep's ſkin round the ſtem, it is cemented with a mixture of bees wax and turpentine melted together, in ſuch proportion as to make a very ſtiff clammy paſte when cold, and over the cement folds of wet bladders are bound firmly with pack thread. To the lower end *e* of the large tube, a ſmaller tube ≈ *e* is cemented, being about $\frac{1}{2}$ of an inch diameter, and 18 inches long, and in ſubſtance full $\frac{1}{8}$ of an inch thick. Theſe tubes are cemented together at *e* with common hard brick duſt or powdered chalk cement, and the joint is farther ſecured with the cement of bees wax and turpentine, over which a wet bladder is bound. The apparatus being thus prepared, the branch is turned downwards, and the glaſs tube upwards, and then both tubes are filled with water; with the finger applied to the open end of the ſmall tube, it is inverted and immerſed in the glaſs ciſtern *x*, full of mercury and water. In this ſituation the lower end of the branch was immerſed ſix inches in water, viz. from *r* to *i*; the water was imbibed by the branch at its tranſverſe cut *i*; and during its aſcent into the ſap veſſels of the branch, the mercury roſe in the tube *e* ≈ from the ciſtern *x*, ſo that in half an hour it was riſen $5\frac{1}{4}$ inches high, as far as ≈. The height of the mercury indicated, in ſome meaſure, the force with which the ſap was imbibed, though not the whole force; becauſe while the water was imbibed by the branch, its tranſverſe cut was covered with innumerable little hemiſpheres of air, and many air bubbles iſſued out of the ſap veſſels, which partly filled the tube *e r*, as the water was drawn out of it: and therefore the height of the mercury could only be proportionable to the exceſs of the quantity of water drawn off above the quantity of the air which iſſued out of the wood. If the quantity of air iſſuing from the wood had been equal to the quantity of water imbibed, it is plain that the mercury could not riſe at all, becauſe there would be no room for it in the tube: but if nine parts in twelve of the water be imbibed by the branch, and only three ſuch parts of air iſſue into the tube in the ſame time the mercury muſt riſe near ſix inches, and ſo proportionably in other caſes. Dr Hales obſerved, that the mercury roſe higheſt, in moſt caſes, when the ſun was clear and warm, and that it ſubſided three or four inches towards evening, but roſe again the next day as it grew warm, though ſeldom ſo high as at firſt. Dr Hales adapted the ſize and ſhape of the glaſs apparatus to a great variety of branches of ſeveral ſizes and of different kinds of trees, and repeated the experiment Fig. 4.

above

Gage. above described, *mutatis mutandus*, in a variety of inſtances. See his Vegetable Statics, vol. i. chap. ii. p. 84, &c.

Tide GAGE, the name of an inſtrument uſed for determining the height of the tides by Mr Bayly, in the courſe of a voyage towards the ſouth pole, &c. in the Reſolution and Adventure, in 1772, 1773, 1774, and 1775. This inſtrument conſiſts of a glaſs tube, whoſe internal diameter was ſeven-tenths of an inch, laſhed faſt to a ten feet fir rod, divided into feet, inches, and quarters: this rod was faſtened to a ſtrong poſt fixed upright and firm in the water. At the lower end of the tube was an exceeding ſmall aperture, through which the water was admitted. In conſequence of this conſtruction, the ſurface of the water in the tube was ſo little affected by the agitation of the ſea, that its height was not altered one tenth of an inch, when the ſwell of the ſea was two feet; and Mr Bayly was certain, that with this inſtrument he could diſcern a difference of one-tenth of an inch in the height of the tide.

Wind GAGE, an inſtrument for meaſuring the force of the wind upon any given ſurface. It was invented by Dr Lind, who gives the following deſcription of it, Phil. Tranſ. vol. lxv.

This inſtrument conſiſts of two glaſs tubes AB, CD, Fig. 5. (fig. 5.) of five or ſix inches in length. Their bores, which are ſo much the better for being equal, are about four-tenths of an inch in diameter. They are connected together like a ſiphon, by a ſmall bent glaſs tube *a b*, the bore of which is about one-tenth of an inch in diameter. On the upper part of the leg AB there is a tube of latten braſs, which is kneed, or bent perpendicularly outwards, and has its mouth open towards F. On the other leg CD, is a cover with a round hole G in the upper part of it two-tenths of an inch in diameter. This cover and the kneed tube are connected together by a ſlip of braſs *e d*, which not only gives ſtrength to the whole inſtrument, but alſo ſerves to hold the ſcale HI. The kneed tube and cover are fixed on with hard cement or ſealing wax. To the ſame tube is ſoldered a piece of braſs *e*, with a round hole in it to receive the ſteel ſpindle KL; and at *f* there is juſt ſuch another piece of braſs ſoldered to the braſs hoop *g h*, which ſurrounds both legs of the inſtrument. There is a ſmall ſhoulder on the ſpindle at *f*, upon which the inſtrument reſts, and a ſmall nut at *i*, to prevent it from being blown off the ſpindle by the wind. The whole inſtrument is eaſily turned round upon the ſpindle by the wind, ſo as always to preſent the mouth of the kneed tube towards it. The end of the ſpindle has a ſcrew on it; by which it may be ſcrewed into the top of a poſt or a ſtand made on purpoſe. It has alſo a hole at L, to admit a ſmall lever for ſcrewing it into wood with more readineſs and facility. A thin plate of braſs *k* is ſoldered to the kneed tube about half an inch above the round hole G ſo as to prevent rain from falling into it. There is g. 6. likewiſe a crooked tube AB (fig. 6.) to be put occaſionally upon the mouth of the kneed tube F, in order to prevent rain from being blown into the mouth of the wind gage when it is left out all night, or expoſed in the time of rain.

The force or momentum of the wind may be aſcertained by the aſſiſtance of this inſtrument, by filling the tubes half full of water, and puſhing the ſcale a little up or down, till the o of the ſcale, when the inſtrument is held up perpendicularly, be on the line with the ſurface of the water in both legs of the wind-gage. The inſtrument being thus adjuſted, hold it up perpendicularly, and turning the mouth of the kneed tube towards the wind, obſerve how much the water is depreſſed by it in the one leg, and raiſed in the other. The ſum of the two is the height of a column of water which the wind is capable of ſuſtaining at that time; and every body that is oppoſed to that wind will be preſſed upon by a force equal to the weight of a column of water, having its baſe equal to the altitude of the column of water ſuſtained by the wind in the wind gage. Hence the force of the wind upon any body where the ſurface oppoſed to it is known may be eaſily found; and a ready compariſon may be made betwixt the ſtrength of one gale of wind and that of another. Gage.

The force of the wind may be likewiſe meaſured with this inſtrument by filling it until the water runs out of the hole G. For if we then hold it up to the wind as before, a quantity of water will be blown out; and if both legs of the inſtrument are of the ſame bore, the height of the column ſuſtained will be equal to double the column of water in either leg, or the ſum of what is wanting in both legs. But if the legs are of unequal bores, neither of theſe will give the true height of the column of water which the wind ſuſtained. But the true height may be obtained by the following formulæ.

Suppoſe that after a gale of wind which had blown the water from A to B (fig. 7.) forcing it at the ſame Fig. 7. time through the other tube out at E, the ſurface of the water ſhould be found ſtanding at ſome level DG, and it were required to know what was the height of the column EF or AB, which the wind ſuſtained. In order to obtain this, it is only neceſſary to find the height of the columns DB or GF, which are conſtantly equal to one another; for either of theſe added to one of the equal columns AD, EG, will give the true height of the column of water which the wind ſuſtained.

1. Let the diameters AC, EH, of the tubes, be reſpectively repreſented by *c d*; and let a=AD, or EG, and x=DB, or FG: Then it is evident, that the column DB is to the column EG as c^2x to d^2a. But theſe columns are equal. Therefore $c^2x=d^2a$; and conſequently $x=\frac{d^2a}{c^2}$.

2. But if at any inſtant of time whilſt the wind was blowing, it was obſerved, that, when the water ſtood at E, the top of the tube out of which it is forced, it was depreſſed in the other to ſome given level BF, the altitude at which it would have ſtood in each, had it immediately ſubſided, may be found in the following manner: Let b=AB or EF.—Then it is evident that the column DB is equal to the difference of columns EF, GF. But the difference of theſe columns is as d^2b-d^2x; and conſequently $x=\frac{d^2b}{c^2+d^2}$.

For the caſes when the wind blows in at the narrow leg of the inſtrument: Let AB=EF=b, EG, or AD=a, GF=DB=x, and the diameters EH, GA, reſpectively

Gage ‖ Gainage.

respectively $=d, c$, as before. Then it is evident, that the column AD is to the column GF as $a c^2$ to $d^2 x$. But these columns are equal; therefore $d^2 x = a c^2$; and consequently $x = \frac{a c^2}{d^2}$. It is also evident that the column AD is equal to the difference of the columns AB, DB; but the difference of these columns is as $b c^2 - c^2 x$. Therefore $d^2 x = b c^2 - c^2 x$. Whence we get $x = \frac{b c^2}{d^2 + c}$.

The use of the small tube of communication $a b$ (fig. 5.) is to check the undulation of the water, so that the height of it may be read off from the scale with ease and certainty. But it is particularly designed to prevent the water from being thrown up to a much greater or less altitude than the true height of the column which the wind is able at that time to sustain, from its receiving a sudden impulse whilst it is vibrating either in its ascent or descent. As in some cases the water in this instrument might be liable to freeze, and thus break the tubes, Dr Lind recommends a saturated solution of sea salt to be used instead of it, which does not freeze till Fahrenheit's thermometer falls to 0.

GAHNIA, a genus of plants belonging to the hexandria class. See BOTANY *Index*.

GAIETA, an ancient, handsome, and strong town of Italy, in the kingdom of Naples, and in the Terra di Lavoro, with a fort, citadel, harbour, and bishop's see. It was taken by the Austrians in 1707, and by the Spaniards in 1734. It is seated at the foot of a mountain near the sea, in E. Long. 13. 37. N. Lat. 41. 30.

GAIN, the profit or lucre a person reaps from his trade, employment, or industry. Some derive the word from the German *gewin:* whereof the Italians had made *guadagno;* the French and English *gain*.

There are legal and reputable gains, as well as sordid and infamous ones. What is gained by gaming is of the latter description. Such gains are not acknowledged by law, so that the payment is not legally binding on the loser.

GAIN, in *Architecture*, is the workman's term for the bevelling shoulder of a joist or other timber. It is used also for the lapping of the end of the joist, &c. upon a trimmer or girder; and then the thickness of the shoulder is cut into the trimmer; also bevelling upwards, that it may just receive the gain; and so the joist and trimmer lie even and level with the surface. This way of working is used in floors and hearths.

To GAIN the Wind, in sea language, is to arrive on the weather side or to windward of some other vessel in sight, when both are plying to windward, or sailing as near the wind as possible.

GAINAGE, GAINAGIUM, in our ancient writers, signifies the draught oxen, horses, wain, plough, and furniture, for carrying on the work of tillage by the baser sort of tokemen and villains.

Gainage is the same with what is otherwise called *wainage*. Bracton, lib. i. cap. 9. speaking of lords and servants, says, *Ut si eos destruant, quod salvum non possit eis esse wainagium suum*. And again, lib. iii. tract. 2. cap. 1. *Villanus non amerciabitur, nisi salvo wainagio suo:* For anciently, as it appears both by Magna Charta, and other books, the villain, when amerced, had his gainage or wainage free, to the end his plough might not stand still; and the law, for the same reason, does still allow a like privilege to the husbandmen; that is, his draught horses are not in many cases distrainable. Gainage ‖ Galatia.

GAINAGE is also used for the land itself, or the profit raised by cultivating it.

GAINSBOROUGH, a town of Lincolnshire in England, 148 miles from London, seated on the east bank of the Trent, which brings tolerably sized vessels with the tide up to the town, about 40 miles from the Humber. It is a large well built town, with a pretty good trade, is noted for its ale, and has the title of an earldom. W. Long. 1. 45. N. Lat. 53. 26. The north marsh in its neighbourhood is noted for horse races. The Danes who invaded the kingdom brought their ships up to this place; and it was here that Sweno the Dane was murdered by one of the English, while revelling with his companions. In the year 1643 a battle was fought here between the royalists and the parliament forces under Cromwell. The number of inhabitants in 1801 amounted to 4506, of whom nearly 600 were employed in trade and manufactures.

GALACTOPHAGI, and GALACTOPOTÆ, in antiquity, persons who lived wholly on milk, without corn or the use of any other food. The words are compounded of γαλα, γαλακτος, *milk;* φαγειν, *to eat;* and ποτης of πινω, *I drink*.

Certain nations in Scythia Asiatica, as the Getæ, Nomades, &c. are famous, in ancient history, in quality of *galactophagi*, or milk-eaters. Homer makes their eloge, Iliad, lib. iii.

Ptolemy, in his geography, places the Galactophagi between the Riphæan mountains on one side, and the Hyrcanian sea on the other.

GALANGALS, in the *Materia Medica*. See KÆMPFERIA.

GALANTHUS, the SNOW DROP, a genus of plants belonging to the hexandria class, and in the natural method ranking under the ninth order, *Spathaceæ*. See BOTANY *Index*

GALASHIELS, a small town in Selkirkshire in Scotland, situated on the stream called Gala Water, at the place where it joins the Tweed. Galashiels and its neighbourhood have been long famous for the manufacture of coarse woollen cloth, known by the name of *Galashiels grey*, and of which 50,000 yards are sold annually. The improved state of the agriculture of this vicinity is much commended. Galashiels is 30 miles S. E. from Edinburgh.

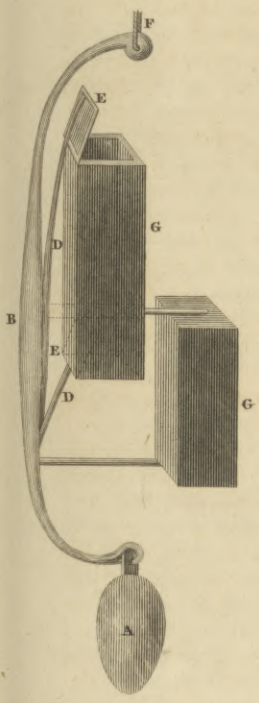
GALATA, a great suburb belonging to Constantinople, opposite to the seraglio, on the other side of the harbour. It is here the Greeks, Armenians, Franks, Christians, and Jews inhabit, and are allowed the exercise of their respective worships.

GALATÆA or GALATHÆA, in fabulous history, a sea nymph, daughter of Nereus and Doris. She was passionately loved by the Cyclops Polyphemus, whom she treated with coldness and disdain; while Acis, a shepherd of Sicily, enjoyed her unbounded affection. The happiness of these two lovers was disturbed by the jealousy of the Cyclops, who crushed his rival to pieces with a piece of a broken rock while he reposed on the bosom of Galatæa. The nymph was inconsolable for the loss of Acis; and as she could not restore him to life, she changed him into a fountain.

GALATIA, the ancient name of a province of Asia Minor, now called *Amasia*. It was bounded on the

Fig. 3.

BUCKET SEA GAGE.



AQUEO MERCURIAL GAGE.

Fig. 4.

Fig. 1.

SEA GAGE.

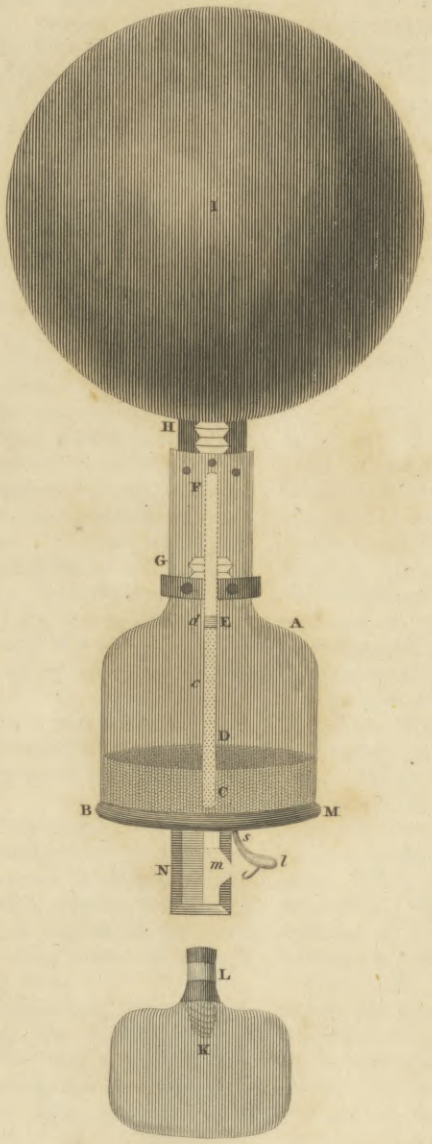


Fig. 2.

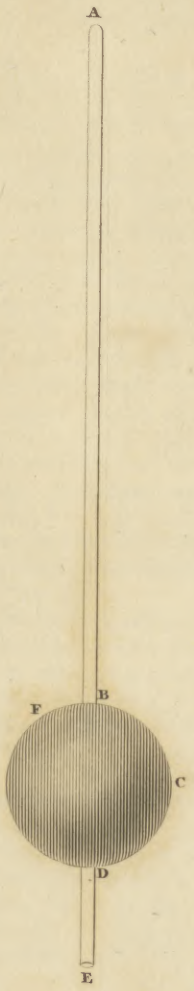


Fig. 5.

WIND GAGE.

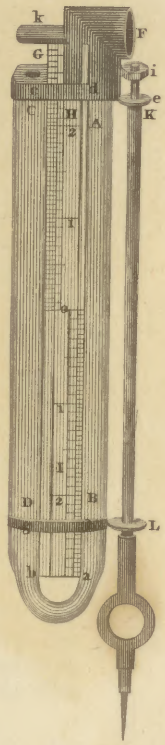


Fig. 6.

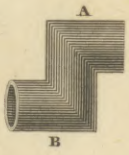
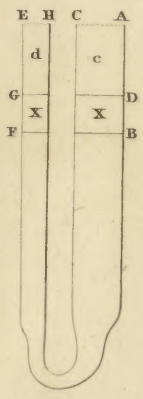
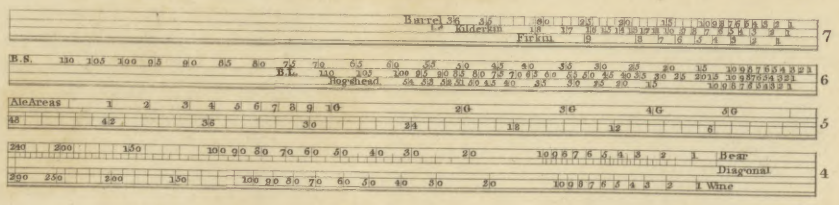


Fig. 7.



FOUR-FOOT GAUGING ROD.



Eng'd by W. & D. Lizars Edin.r

Galatia || Galba.

the eaſt by Cappadocia, on the weſt by Bithynia, on the ſouth by Pamphylia, and on the north by the Euxine ſea. It was the north part of Phrygia Magna; but upon being occupied by the Gauls was called *Galatia;* and becauſe ſituated amidſt Greek colonies, and itſelf mixed with Greeks, *Gallogræcia.* Strabo calls it *Galatia* and *Gallogræcia;* hence a twofold name of the people; *Galatæ* and *Gallogræci.* The Greeks called it *Gallia Parva;* to diſtinguiſh it from the *Tranſalpina,* both which they called *Galatia.* It was reduced under the ſubjection of the Romans in the time of Auguſtus, and is now in the hands of the Turks. Here St Paul founded a church, to which he directed that epiſtle which is ſtill known by the name of the *Epiſtle to the Galatians,* and was written to reclaim them from the obſervation of Jewiſh ordinances, into which they had been ſeduced by ſome falſe teachers.

GALAX, a genus of plants belonging to the pentandria claſs, and in the natural method ranking with thoſe of which the order is doubtful. See BOTANY.

GALAXY, in *Aſtronomy,* that long, white, luminous track, which ſeems to encompaſs the heavens like a ſwath, ſcarf, or girdle: and which is eaſily perceivable in a clear night, eſpecially when the moon does not appear. The Greeks call it Γαλαξιας, *Galaxy,* of Γαλα, γαλακλος, *Milk;* on account of its colour and appearance: the Latins, for the ſame reaſon, call it *via lactea;* or *milky way.* It paſſes between Sagittarius and Gemini, and divides the ſphere into two parts; it is unequally broad; and in ſome parts is ſingle, in others double.

The ancient poets, and even philoſophers, ſpeak of the Galaxy as the road or way by which the heroes went to heaven.

Ariſtotle makes it a kind of meteor, formed of a crowd of vapours, drawn into that part by certain large ſtars diſpoſed in the regions of the heavens anſwering hereto.

Others, finding that the Galaxy was ſeen all over the globe, that it always correſponded to the ſame fixed ſtars, and that it tranſcended the height of the higeſt planets, ſet aſide Ariſtotle's opinion, and placed the Galaxy in the firmament, or region of the fixed ſtars, and concluded it to be nothing but an aſſemblage of an infinite number of minute ſtars.

Since the invention of the teleſcope, this opinion has been abundantly confirmed. By directing a good teleſcope to any part of the milky way; where before we only ſaw a confuſed whiteneſs, we now deſcry an innumerable multitude of little ſtars, ſo remote, that a naked eye confounds them. See ASTRONOMY, N° 211.

GALBA, SERGIUS SULPICIUS, a Roman emperor, born the 24th of December, five years before the Chriſtian era. He was gradually raiſed to the greateſt offices of the ſtate, and exerciſed his power in the provinces with the greateſt equity and unremitted diligence. He dedicated the greateſt part of his time to ſolitary purſuits, chiefly to avoid the ſuſpicions of Nero. His diſapprobation of the emperor's oppreſſive command in the provinces was the cauſe of new diſturbances. Nero ordered him to be put to death; but he eſcaped from the hands of the executioner, and was publicly ſaluted emperor. When he was ſeated on the throne, he ſuffered himſelf to be governed by favourites, who expoſed the goods of the citizens to ſale to gratify their avarice. Exemptions were ſold at a high price; and the crime of murder was blotted out, and impunity purchaſed, with a large ſum of money. Such irregularities in the emperor's miniſters greatly diſpleaſed the people; and when Galba refuſed to pay the ſoldiers the money which he had promiſed them when he was raiſed to the throne, they aſſaſſinated him in the 73d year of his age, and the eighth month of his reign. The virtues which had ſhone ſo bright in Galba when a private man, totally diſappeared when he aſcended the throne; and he who ſhowed himſelf the moſt impartial judge, forgot the duties of an emperor and of a father of his people.

Galba || Gale.

GALBANUM, in *Pharmacy,* a gum iſſuing from the ſtem of an umbelliferous plant growing in Perſia and many parts of Africa. See BUBON, BOTANY *Index.*

The juice, as brought to us, is ſemipellucid, ſoft, tenacious; of a ſtrong, and to ſome unpleaſant, ſmell; and a bitteriſh warm taſte: the better ſort is in pale coloured maſſes, which, on being opened, appear compoſed of clear white tears. Geoffroy relates, that a dark greeniſh oil is to be obtained from this ſimple by diſtillation, which, upon repeated rectifications, becomes of an elegant ſky blue colour. The purer ſorts of galbanum are ſaid by ſome to diſſolve entirely in wine, vinegar, or water; but theſe liquors are only partial menſtrua with regard to this drug; nor do ſpirit of wine or oils prove more effectual in this reſpect: the beſt diſſolvent is a mixture of two parts ſpirit of wine and one of water. Galbanum agrees in virtue with gum ammoniacum; but is generally accounted leſs efficacious in aſthmas, and more ſo in hyſterical complaints. It is an ingredient in various officinal compoſitions. See MATERIA MEDICA *Index.*

GALE, in the ſea language, a term of various import. When the wind blows not ſo hard but that a ſhip may carry her top ſails a-trip (that is hoiſted up to the higheſt), then they ſay it is a loom gale. When it blows very ſtrong, they ſay it is a ſtiff, ſtrong, or freſh gale. When two ſhips are near one another at ſea, and, there being but little wind blowing, one of them finds more of it than the other, they ſay that the one ſhip gales away from the other.

GALE, *Dr John,* an eminent and learned miniſter among the Baptiſts, was born at London in 1680. He ſtudied at Leyden, where he diſtinguiſhed himſelf very early, and afterwards at Amſterdam, under Dr Limborch. He was choſen miniſter of the Baptiſt congregation at Barbican; where his preaching, being chiefly practical, was greatly reſorted to by people of all perſuaſions. Four volumes of his ſermons were publiſhed after his death, which happened in 1721. His Reflections on Dr Wall's Hiſtory of Infant Baptiſm is the beſt defence of the Baptiſts ever publiſhed, and the reading of that performance induced the learned Mr William Whiſton and Dr Foſter to become Baptiſts.

GALE, *Theophilus,* an eminent nonconformiſt miniſter, born in 1628. He was invited to Wincheſter in 1657; and continued a ſtated preacher there until the re-eſtabliſhment of the church by Charles II. when he rather choſe to ſuffer the penalties of the act of conformity, than to ſubmit to it contrary to his conſcience. He was afterwards engaged by Philip Lord Wharton as tutor to his ſons, whom he attended to an academy at Caen in Normandy; and when this duty

Gale ‖ Galen.

was fulfilled, he became paſtor over a congregation of private conventiclers in Holborn. He died in 1678; and is principally known by an elaborate work, intitled, the *Court of the Gentiles*, calculated to ſhow, that the Pagan philoſophers derived their moſt ſublime ſentiments from the Scriptures.

GALE, *Dr Thomas*, a learned divine, born at Scruton in Yorkſhire, in the year 1636, was educated at Cambridge, and at length became profeſſor of the Greek language in that univerſity. He was afterwards choſen head maſter of St Paul's ſchool, London; and was employed by the city in writing thoſe elegant inſcriptions on the monument erected in memory of the conflagration in 1666. In 1676 he was collated to a prebend in the cathedral of St Paul's; and was likewiſe elected a fellow of the Royal Society, to which he preſented a Roman urn with its aſhes. About the year 1697, he gave to the new library of Trinity college, in Cambridge, a great number of Arabic manuſcripts; and in the ſame year he was admitted dean of York. He died in that city in 1702; and was interred in the cathedral, where a monument, with a Latin inſcription, was erected to his memory. He was a learned divine, a great hiſtorian, one of the beſt Greek ſcholars of his age, and maintained a correſpondence with the moſt learned men abroad as well as at home. He publiſhed, 1. *Hiſtoriæ Poeticæ Antiqui Scriptores*, octavo. 2. *Opuſcula Mythologica, Ethica, et Phyſica*, in Greek and Latin, octavo. 3. *Herodoti Hiſtoria*, folio. 4. *Hiſtoriæ Anglicanæ Scriptores quinque*, in folio. 5. *Hiſtoriæ Britannicæ, Saxonicæ, Anglo-Danicæ, Scriptores quindecim*, in folio. 6. *Rhetores Selecti*, &c.

GALEA, in antiquity, a light caſque, head piece, or morrion, coming down to the ſhoulders, and commonly of braſs; though Camillus, according to Plutarch, ordered thoſe of his army to be of iron, as being the ſtronger metal. The lower part of it was called *buccula*, and on the top was a creſt. The velites wore a light galea, made of the ſkin of ſome wild beaſt to make it more terrible.

GALEASSE, a large low-built-veſſel, in which both ſails and oars are uſed, and the largeſt of all the veſſels that make uſe of the latter. It may carry twenty guns, and has a ſtern capable of lodging a great number of marines. It has three maſts, which are never to be lowered or taken down. It has alſo thirty-two benches of rowers; and to each bench ſix or ſeven ſlaves, who ſit under cover. This veſſel is at preſent uſed only by the Venetians.

GALEGA, a genus of plants belonging to the diadelphia claſs; and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY *Index*.

GALEN, CLAUDIUS, in Latin *Galenus*, prince of the Greek phyſicians after Hippocrates, was born at Pergamus in the leſſer Aſia, about the year 131. His father was poſſeſſed of a conſiderable fortune; was well verſed in polite literature, philoſophy, aſtronomy, and geometry; and was alſo well ſkilled in architecture. He himſelf inſtructed his ſon in the firſt rudiments of learning, and afterwards procured him the greateſt maſters of the age in philoſophy and eloquence. Galen having finiſhed his ſtudies under their care, choſe phyſic for his profeſſion, and chiefly ſtudied the works of Hippocrates. Having at length exhauſted all the ſources of literature that were to be found at home, he reſolved to travel, in order to converſe with the moſt able phyſicians in all parts, intending at the ſame time to take every opportunity of inſpecting on the ſpot the plants and drugs of the countries through which he paſſed. With this view he went to Alexandria, and ſtaid ſome years in that metropolis of Egypt; from thence he travelled through Cilicia; paſſed through Paleſtine; viſited the iſles of Crete and Cyprus; and made two voyages to Lemnos, in order to examine the Lemnian earth, which was then eſteemed an admirable medicine. With the ſame view he went into the Lower Syria, in order to obtain a thorough inſight into the nature of the opobalſamum, or balm of Gilead; and having completed his deſign, returned home by the way of Alexandria.

Galen ‖ Galenic.

Galen had been four years at Pergamus, where his practice was attended with extraordinary applauſe, when ſome ſeditious commotions induced him to go to Rome, where he reſolved to ſettle: but the proofs he gave of his ſuperior ſkill, added to the reſpect ſhown him by ſeveral perſons of very high rank, created him ſo many enemies among his brethren of the faculty, that he was obliged to quit the city, after having reſided there four or five years. But he had not long returned to Pergamus, when he was recalled by the emperors Aurelius and Verus. After their death, he retired to his native country; where he died about the year 200. He wrote in Greek; and is ſaid to have compoſed two hundred volumes, which were unhappily burnt in the temple of Peace. The beſt editions of thoſe that remain, are, that printed at Baſil in 1538, in five volumes, and that of Venice in 1625, in ſeven volumes. Galen was of a weak and delicate conſtitution, as he himſelf aſſerts; but he nevertheleſs, by his temperance and ſkill in phyſic, arrived at a great age; for it was his maxim, always to riſe from table with ſome degree of appetite. He is juſtly conſidered as the greateſt phyſician of antiquity, next to Hippocrates; and he performed ſuch ſurpriſing cures, that he was accuſed of magic.

GALEN, a military townſhip in the ſtate of New-York, ſituated on the creek of Cauadaque, about 12 miles north-weſt of Cayuga lake, and 13 ſouth by eaſt of Great Sodus.

GALENA, a name given by mineralogiſts to a ſpecies of lead ore. See *LEAD-Mine*, and MINERALOGY *Index*. It was alſo the original name given by Andromachus to the theriaca, from its effect in bringing on a pleaſing calm over the blood and ſpirits on taking it.

GALENIA, a genus of plants belonging to the octandria claſs; and in the natural method ranking under the 13th order, *Succulentæ*. See BOTANY *Index*.

GALENIC, or GALENICAL, in *Medicine*, is that manner of conſidering and treating diſeaſes, founded on the principles of Galen, or introduced by GALEN. This author, collecting and digeſting what the phyſicians before him had done, and explaining every thing according to the ſtricteſt doctrine of the Peripatetics, ſet phyſic on a new footing: he introduced the doctrine of the four elements; the cardinal qualities and their degrees; and the four humours or temperaments.

GALENIC is more frequently uſed as contradiſtinguiſhed from *chemical*.

The diſtinction of *galenical* and *chemical* was occaſioned

Galenic || Galilee.

Galilee || Galileo.

fioned by a diviſion of the practitioners of medicine into two ſects, which happened on the introduction of chemiſtry into medicine. Then the chemiſts, arrogating to themſelves every kind of merit and ability, ſtirred up an oppoſition to their pretenſions, founded on the invariable adherence of the other party to the ancient practice. And though this diviſion into the two ſects of galeniſts and chemiſts has long ſince ceaſed, yet the diſtinction of medicines which reſulted from it is ſtill ſometimes obſerved.

Galenical medicines are thoſe which are formed by the eaſier preparations of herbs, roots, &c. by infuſion, decoction, &c. and by combining and multiplying ingredients; while thoſe of chemiſtry draw their more intimate and remote virtues by means of fire and elaborate preparations, as calcination, digeſtion, fermentation, &c.

GALENISTS, a denomination given to ſuch phyſicians as practiſe, preſcribe, or write, on the galenical principles; and ſtand oppoſed to the *chemiſts*. See GALENICAL. At preſent the galeniſts and chemiſts are pretty well accommodated; and moſt of our phyſicians uſe the preparations and remedies of both.

GALENISTS, or *Galenites*, in church hiſtory, a branch of Mennonites or Anabaptiſts, who take in ſeveral of the opinions of the Socinians, or rather Arians, touching the divinity of our Saviour. In 1664 the Waterlandians were divided into two parties, of which the one were called *Galeniſts*, and the other *Apoſtolians*. They are thus called from their leader Abr. Galenus, a learned and eloquent phyſician of Amſterdam, who conſidered the Chriſtian religion as a ſyſtem that laid much leſs ſtreſs on faith than practice; and who was for taking into the communion of the Mennonites all thoſe who acknowledged the divine origin of the books of the Old and New Teſtament, and led holy and virtuous lives.

GALEON. See GALLEON.

GALEOPSIS, a genus of plants belonging to the didynamia claſs; and in the natural method ranking under the 42d order, *Verticillatæ*. See BOTANY *Index*.

GALERICULUM, was a cap worn both by men and women amongſt the ancient Romans. It conſiſted of ſkin, which was ſo neatly dreſſed with human hair, that the artificial covering could ſcarcely be diſtinguiſhed from the natural. It was uſed by thoſe whoſe hair was thin; and by wreſtlers, to keep their own hair from receiving any injury from the naſty oils with which they were rubbed all over before they exerciſed. It ſeems to have reſembled our wigs.

GALIC, or *GAELIC Language*. See HIGHLANDS.

GALICIA, a province of Spain, bounded on the north and weſt by the ocean, on the ſouth by Portugal, and on the eaſt by Aſturias and the kingdom of Leon. The air is temperate along the coaſt; but, in other places, it is cold and moiſt. It is but thin of people: and the produce is wine, flax, and citrons: the ſoil is unequal, but affords good paſture; the mountains yield iron, copper, and lead; and the foreſts produce wood for building ſhips. St Jago di Compoſtella is the capital town.

GALILEE, once a province of Judea, now of Turkey in Aſia, was bounded by Mount Lebanon on the north, by the river Jordan and the ſea of Galilee on the eaſt, by the Chiſon on the ſouth, and by the Mediterranean on the weſt. It was the ſcene of many of our Saviour's miracles; but the bounds of the country are not now well known, nor yet the places where many of the towns ſtood.

GALILEANS, a ſect of the Jews. Their founder was one Judas a native of Galilee, from which place they derived their name. Their chief, eſteeming it an indignity for the Jews to pay tribute to ſtrangers, raiſed up his countrymen againſt the edict of the emperor Auguſtus, which had ordered a taxation or enrolment of all the ſubjects of the Roman empire.

They pretended that God alone ſhould be owned as Maſter and Lord, and in other reſpects were of the opinion of the Phariſees; but, as they judged it unlawful to pray for infidel princes, they ſeparated themſelves from the reſt of the Jews, and performed their ſacrifices apart.

As our Saviour and his apoſtles were of Galilee, they were ſuſpected to be of the ſect of Galileans; and it was on this principle, as St Jerome obſerves, that the Phariſees laid a ſnare for him; aſking, Whether it was lawful to give tribute to Cæſar; that in caſe he denied it, they might have an occaſion of accuſing him.

GALILEO, GALILEI, the famous mathematician and aſtronomer, was the ſon of a Florentine nobleman, and born in the year 1564. He had from his infancy a ſtrong inclination to philoſophy and the mathematics; and made prodigious progreſs in theſe ſciences. In 1592, he was choſen profeſſor of mathematics at Padua; and during his abode there he *invented*, it is ſaid, the teleſcope; or, according to others, improved that inſtrument, ſo as to make it fit for aſtronomical obſervations: (See ASTRONOMY, N° 27.). In 1611, Coſmo II. grand duke of Tuſcany ſent for him to Piſa, where he made him profeſſor of mathematics with a handſome ſalary, and ſoon after inviting him to Florence, gave him the office and title of *principal philoſopher and mathematician to his highneſs*.

He had been but a few years at Florence, before he was convinced by ſad experience, that Ariſtotle's doctrine, however ill grounded, was held too ſacred to be called in queſtion. Having obſerved ſome ſolar ſpots in 1612, he printed that diſcovery the following year at Rome; in which, and in ſome other pieces, he ventured to aſſert the truth of the Copernican ſyſtem, and brought ſeveral new arguments to confirm it. For theſe he was cited before the inquiſition; and after ſome months impriſonment, was releaſed upon a ſimple promiſe, that he would renounce his heretical opinions, and not defend them by word or writing. But having afterwards, in 1632, publiſhed at Florence his "Dialogues of the two greateſt ſyſtems of the world, the Ptolemaic and Copernican," he was again cited before the inquiſition, and committed to the priſon of that eccleſiaſtical court at Rome. In June 22d N. S. that year, the congregation convened: and in his preſence pronounced ſentence againſt him and his books, obliging him to abjure his errors in the moſt ſolemn manner; committed him to the priſon of their office during pleaſure; and enjoined him, as a ſaving penance, for three years to come, to repeat once a-week the ſeven penitential pſalms: reſerving to themſelves, however, the power of moderating, changing, or taking away altogether or in part, the above-mentioned puniſh-

Galileo ‖ Gall.

ment and penance. On this ſentence, he was detained a priſoner till 1634; and his "Dialogues of the ſyſtem of the World" were burnt at Rome.

He lived ten years after this, ſeven of which were employed in making ſtill further diſcoveries with his teleſcope. But by the continual application to that inſtrument, added to the damage he received in his ſight from the nocturnal air, his eyes grew gradually weaker, till he became totally blind in 1639. He bore this calamity with patience and reſignation, worthy of a great philoſopher. The loſs neither broke his ſpirit, nor hindered the courſe of his ſtudies. He ſupplied the defect by conſtant meditation: whereby he prepared a large quantity of materials, and began to dictate his own conceptions; when, by a diſtemper of three months continuance, waſting away by degrees, he expired at Arcetti near Florence, in January 1642, N. S. in the 78th year of his age.

Among various uſeful inventions of which Galileo was the author, is that of the ſimple pendulum, which he had made uſe of in his aſtronomical experiments. He had thoughts of applying it to clocks; but did not execute it: the glory of that invention was reſerved for Vicenzio his ſon, who made the experiment at Venice in 1649; and M. Huygens afterwards carried this invention to perfection. He wrote a great number of treatiſes, ſeveral of which were publiſhed in a collection by Signior Mendeſſi, under the title of *L'opera di Galileo Galilei Lynceo*. Some of theſe, with others of his pieces, were tranſlated into Engliſh and publiſhed by Thomas Saliſbury, Eſq. in his mathematical collections, &c. in two volumes folio. A volume alſo of his letters to ſeveral learned men, and ſolutions of ſeveral problems, were printed at Bologna in quarto. Beſides theſe, he wrote many others, which were unfortunately loſt through his wife's devotion; who, ſolicited by her confeſſor, gave him leave to peruſe her huſband's manuſcripts; of which he tore and took away as many as he ſaid were not fit to be publiſhed.

GALINACEUS LAPIS. See GALLINACEUS.

GALIUM, a genus of plants belonging to the tetrandria claſs; and in the natural method ranking under the 47th order, *Stellatæ*. See BOTANY *Index*.

GALL, in the animal economy. See BILE.

Gall was generally given amongſt the Jews to perſons ſuffering death under the execution of the law, to make them leſs ſenſible of their pain; but gall and myrrh are ſuppoſed to have been the ſame thing; becauſe at our Saviour's crucifixion, St Matthew ſays, they gave him vinegar to drink mingled with gall; whereas St Mark calls it wine mingled with myrrh: The truth of the matter perhaps is, that they diſtinguiſhed every thing bitter by the name of gall. The Greeks and Romans alſo gave ſuch a mixture to perſons ſuffering a death of torture.

A great number of experiments have been made upon the gall of different animals, but few concluſions can be drawn from them with any certainty. Dr Percival, however, hath ſhown, that putrid bile may be perfectly corrected and ſweetened by an admixture of the vegetable acids, vinegar, and juice of lemons. Theſe, he obſerves, have this effect much more completely than the mineral ones: and hence, he thinks, ariſes the great uſefulneſs of the vegetable acids in autumnal diſeaſes; which are always attended with a putreſcent diſpoſition of the bile, owing to the heat of the preceding ſummer. On this occaſion he takes notice of a common miſtake among phyſicians, who frequently preſcribe elixir of vitriol in thoſe diſeaſes where vinegar or lemon juice would be much more effectual. Gall.

From this effect of acids on the gall, he alſo thinks, we may ſee why the immoderate uſe of acids is ſo pernicious to digeſtion. It is neceſſary to health that the gall ſhould be in ſome degree acrid and alkaleſcent: but as acids have the property of rendering it perfectly mild and ſweet, they muſt be proportionably pernicious to the due concoction and aſſimilation of the food; which without an acrid bile cannot be accompliſhed. Hence the body is deprived of its proper nouriſhment and ſupport, the blood becomes vapid and watery, and a fatal cachexy unavoidably enſues. This hath been the caſe with many unfortunate perſons, who, in order to reduce their exceſſive corpulency, have indulged themſelves in the too free uſe of vinegar. From the mild ſtate of the gall in young children, Dr Percival alſo thinks it is, that they are ſo much troubled with acidities.

GALL-Bladder. See ANATOMY, N° 97.

GALL, in *Natural Hiſtory*, denotes any protuberance or tumour produced by the puncture of inſects on plants and trees of different kinds.

Theſe galls are of various forms and ſizes, and no leſs different with regard to their internal ſtructure. Some have only one cavity, and others a number of ſmall cells communicating with each other. Some of them are as hard as the wood of the tree they grow on, whilſt others are ſoft and ſpongy; the firſt being termed *gall nuts*, and the latter *berry galls*, or *apple galls*.

The general hiſtory of the gall is this. An inſect of the fly kind (the cynips) is inſtructed by nature to take care for the ſafety of her young, by lodging her eggs in a woody ſubſtance, where they will be defended from all injuries: ſhe for this purpoſe wounds the leaves or tender branches of a tree; and the lacerated veſſels, diſcharging their contents, ſoon form tumours about the holes thus made. The external coat of this excreſcence is dried by the air; and grows into a figure which bears ſome reſemblance to the bow of an arch, or the roundneſs of a kernel. This little ball receives its nutriment, growth, and vegetation, as the other parts of the tree, by ſlow degrees, and is what we call the *gall nut*. The worm that is hatched under this ſpacious vault, finds in the ſubſtance of the ball, which is as yet very tender, a ſubſiſtence ſuitable to its nature; gnaws and digeſts it till the time comes for its transformation to a nymph, and from that ſtate of exiſtence changes into a fly. After this, the inſect, perceiving itſelf duly provided with all things requiſite, diſengages itſelf ſoon from its confinement, and takes its flight into the open air. The caſe, however, is not ſimilar with reſpect to the gall nut that grows in autumn. The cold weather frequently comes on before the worm is transformed into a fly, or before the fly can pierce through its encloſure. The nut falls with the leaves; and although you may imagine that the fly which lies within is loſt, yet in reality it is not ſo; on the contrary, its being covered up ſo cloſe, is the means of its preſervation. Thus it ſpends the winter in a warm houſe, where every crack and cranny of the nut is well ſtopped up; and lies buried as it

Gall, Galla.

it were under a heap of leaves, which preſerves it from the injuries of the weather. This apartment, however, though ſo commodious a retreat in the winter, is a perfect priſon in the ſpring. The fly, rouſed from its lethargy by the firſt heats, breaks its way through, and ranges where it pleaſes. A very ſmall aperture is ſufficient, ſince at this time the fly is but a diminutive creature. Beſides, the ringlets whereof its body is compoſed dilate and become pliant in the paſſage.

Oak galls put, in a very ſmall quantity, into a ſolution of vitriol in water, though but a very weak one, give it a purple or violet colour: which, as it grows ſtronger, becomes black; and on this property depends the art of making our writing ink, as alſo the arts of dyeing and dreſſing leather, and other manufactures. See INK, CHEMISTRY *Index*.

The beſt galls come from Aleppo: theſe are not quite round and ſmooth like the other ſorts, but have ſeveral tubercles on the ſurface. Galls have a very auſtere ſtyptic taſte, without any ſmell: they are very ſtrong aſtringents, and as ſuch have been ſometimes made uſe of both internally and externally, but are not much taken notice of by the preſent practice. Some recommend an ointment of powdered galls and hogs lard as very effectual in certain painful ſtates of hæmorrhois; and it is alleged, that the internal uſe of galls has cured intermittents after the Peruvian bark has failed. A mixture of galls with a bitter and aromatic has been propoſed as a ſubſtitute for the bark.

GALL, *St*, a conſiderable town in Swiſſerland, and in the Upper Thurgow, with a rich and celebrated abbey, whoſe abbot is a prince of the empire. This place has for ſome time been a republic, in alliance with the cantons. It is not very large; but is well built, neat, populous. It contains about 10,000 inhabitants, who are chiefly employed in the linen manufacture; and make annually, it is ſaid, 40,000 pieces of linen, of 200 ells each; which renders it one of the richeſt towns in Swiſſerland. The inhabitants are Proteſtants; for which reaſon there are often great conteſts between them and the abbey about religious affairs. It is ſeated in a narrow barren valley, between two mountains, and upon two ſmall ſtreams. E. Long. 2. 59. N. Lat. 47. 38.

GALL-Fly. See CYNIPS, ENTOMOLOGY *Index*.

GALLA, an Abyſſinian nation, originally dwelling, as Mr Bruce ſuppoſes, under the line, and exerciſing the profeſſion of ſhepherds, which they ſtill continue to do. For a number of years, our author tells us, they have been conſtantly migrating northwards, though the cauſe of this migration is not known. At firſt they had no horſes; the reaſon of which was, that the country they came from did not allow theſe animals to breed: but as they proceeded northward and conquered ſome of the Abyſſinian provinces, they ſoon furniſhed themſelves with ſuch numbers, that they are now almoſt entirely cavalry, making little account of infantry in their armies. On advancing to the frontiers of Abyſſinia, the multitude divided, and part directed their courſe towards the Indian ocean; after which, having made a ſettlement in the eaſtern part of the continent, they turned ſouthward into the countries of Bali and Dawaw, which they entirely conquered, and ſettled there in the year 1537. Another diviſion having taken a weſterly courſe, ſpread themſelves in a ſemicircle along the banks of the Nile; ſurrounding the country of Gojam, and paſſing eaſtward behind the country of the Agows, extended their poſſeſſions as far as the territories of the Gongas and Gafats. Since that time the Nile has been the boundary of their poſſeſſions; though they have very frequently plundered, and ſometimes conquered, the Abyſſinian provinces on the other ſide of the river, but have never made any permanent ſettlement in theſe parts. A third diviſion has ſettled to the ſouthward of the low country of Shoa, which the governor of that province has permitted, in order to form a barrier betwixt him and the territories of the emperor, on whom he ſcarcely acknowledges any dependence. Galla.

The Galla are of a brown complexion, and have long black hair; but ſome of them who live in the valleys are entirely black. At firſt their common food was milk and butter; but ſince their intercourſe with the Abyſſinians, they have learned to plough and ſow their land, and to make bread. They ſeem to have predilection for the number ſeven, and each of the three diviſions already mentioned are ſubdivided into ſeven tribes. In behaviour they are extremely barbarous; and live in continual war with the Abyſſinians, whom they murder without mercy as often as they fall into their hands. They cut off the privities of the men, and hang them up in their houſes by way of trophies; and are ſo cruel as to rip up women with child, in hopes of thus deſtroying a male. Yet notwithſtanding their exceſſive cruelty abroad, they live under the ſtricteſt diſcipline at home; and every broil or quarrel is inſtantly puniſhed according to the nature of the offence. Each of the three diviſions of the Galla above mentioned has a king of its own; and they alſo have a kind of nobility, from among whom the ſovereign can only be choſen: however, the commonalty are not excluded from riſing to the rank of nobles if they diſtinguiſh themſelves very much in battle. None of the nobility can be elected till upwards of 40 years of age, unleſs he has with his own hand killed a number of enemies which added to his own age makes up 40. There is a council of each of the ſeven tribes, which meets ſeparately in its own diſtrict, to ſettle how many are to be left behind for the governing and cultivating of the territory, and other matters of importance. Theſe nations have all a great veneration for a tree which grows plentifully in their country, called *wanzey*, and which theſe ſuperſtitious people are even ſaid to adore as a god. Their aſſemblies for the choice of a king are all held under one of theſe trees; and when the ſovereign is choſen, they put a bludgeon of this wood in his hand by way of ſceptre, and a garland of the flowers upon his head.

The Galla are reported to be very good ſoldiers, eſpecially in caſes of ſurpriſe; but, like moſt other barbarians, have no conſtancy nor perſeverance after the firſt attack. They will, however, perform extraordinary marches, ſwimming rivers holding by the horſe's tail, and thus being enabled to do very great miſchief by reaſon of the rapidity of the movements. They are excellent light horſe for a regular army in a hoſtile country; but are very indifferently armed on account of the ſcarcity of iron among them. Their principal arms are lances made of wood ſharpened at the end and hardened in the fire; and their ſhields are compoſed only of one ſingle fold of bull's hide; ſo that they are extremely apt to warp by heat, or become too

ſoft,

Galla || Galle.

ſoft in wet weather. They are exceedingly cruel; and make a ſhrill horrid noiſe at the beginning of every engagement, which greatly terrifies the horſes, and very often the barbarous riders which oppoſe them.

The Galla, according to Mr Bruce's account, are ſomewhat below the middle ſize, but extremely light and nimble. The women are fruitful; and ſuffer ſo little in childbearing, that they do not even confine themſelves for a ſingle day after delivery. They plough, ſow, and reap the corn, which is trodden out by the cattle; but the men have all the charge of the cattle in the fields. In their cuſtoms they are filthy to the laſt degree; plaiting their hair with the guts of oxen, which they likewiſe twiſt round their middle, and which by the quick putrefaction occaſion an abominable ſtench. They anoint their heads and whole bodies with butter or greaſe; in which, as well as in other reſpects, they greatly reſemble the Hottentots. It has been ſuppoſed that they have no religion whatever; but Mr Bruce is of opinion that this is a miſtake. The wanzey, he ſays, is undoubtedly worſhipped by all the nations as a god; and they have likewiſe certain ſtones which are worſhipped as gods: beſides theſe, they worſhip the moon, and ſome ſtars, when in certain poſitions, and at ſome particular ſeaſons of the year. They all believe in a reſurrection; and have ſome faint notions of a ſtate of happineſs, but no idea of future puniſhment. Some of them to the ſouthward profeſs the Mahometan religion, but thoſe to the eaſt and weſt are generally Pagans. All of them intermarry with each other; but will not allow ſtrangers to live among them, though the Moors have at laſt found out a method of trading ſafely with them. The commodities they deal in are blue Surat cloths, myrrh, and ſalt; the laſt being the moſt valuable article.

The marriages among the Galla are celebrated with ſome of the diſguſting cuſtoms of the Hottentots; and after theſe ceremonies the bridegroom promiſes to give the bride meat and drink while ſhe lives, and to bury her when dead. Polygamy is allowed among them; but it is ſingular, that among theſe people the women ſolicit their huſbands to take others to their embraces. The reaſon of this cuſtom is, that the men may have numerous families of children, who may be capable of defending them againſt their enemies; as the Galla, according to our author, always fight in families, whether againſt foreign enemies or with one another.

GALLAND, ANTHONY, a learned antiquarian, member of the Academy of Inſcriptions, and profeſſor of Arabic in the Royal College of Paris, was born of poor parents at Rollo, a village in Picardy. Having ſtudied at the Sorbonne and other univerſities, he travelled into the eaſt; where he acquired great ſkill in the Arabic tongue, and in the manners of the Mahometans. He wrote ſeveral works; the principal of which are, 1. An account of the Death of the Sultan Oſman, and the Coronation of the Sultan Muſtapha. 2. A Collection of Maxims, drawn from the works of the Orientals. 3. A Treatiſe on the Origin of Coffee. 4. The Arabian Nights Entertainments, &c.

GALLANT, or GALANT, a French term adopted into our language, and ſignifying polite, civil, and well bred, with a diſpoſition to pleaſe, particularly the ladies. It alſo ſignifies brave or courageous.

GALLE, the name of ſeveral engravers, of whom the principal was Cornelius, who flouriſhed about the 1600. He learned the art of engraving from his father, and imitated his ſtiff ſtile, till he went to Rome, where he reſided a conſiderable time, and there acquired that freedom, taſte, and correctneſs of drawing, which are found in his beſt works. He ſettled at Antwerp upon his return from Italy, where he carried on a conſiderable commerce in prints. His beſt prints are thoſe done after Rubens.

Galle || Galleries.

GALLEON, in naval affairs, a ſort of ſhips employed in the commerce of the Weſt Indies. The Spaniards ſend annually two fleets; the one for Mexico, which they call the *flota*; and the other for Peru, which they call the *galleons*. See FLOTA.

By a general regulation made in Spain, it has been eſtabliſhed, that there ſhould be twelve men of war and five tenders annually fitted out for the armada or galleons; eight ſhips of 600 tons burden each, and three tenders, one of 100 tons, for the iſland Margarita, and two of 80 each, to follow the armada; for the New Spain fleet, two ſhips of 600 tons each, and two tenders of 80 each; and for the Honduras fleet, two ſhips of 500 tons each: and in caſe no fleet happened to ſail any years, three galleons and a tender ſhould be ſent to New Spain for the plate.

They are appointed to ſail from Cadiz in January, that they may arrive at Porto Bello about the middle of April; where, the fair being over, they may take aboard the plate, and be at Havannah with it about the middle of June; where they are joined by the flota that they may return to Spain with the greater ſafety.

GALLEOT, a ſmall galley deſigned only for chaſe, carrying but one maſt and two pattereroes; it can both ſail and row, and has 16 or 20 oars. All the ſeamen on board are ſoldiers, and each has a muſket by him on quitting his oar.

GALLERIES, in *Gardening*, are certain ornaments made with trees of different kinds; which are very common in all the French gardens, but are ſeldom introduced into the Britiſh ones, eſpecially ſince the taſte for clipped trees has been exploded. For thoſe, however, who may ſtill chooſe to have them, Mr Miller gives the following directions.

In order to make a gallery in a garden with porticoes and arches, a line muſt firſt be drawn of the length you deſign the gallery to be; which being done, it is to be planted with hornbeam, as the foundation of the gallery. The management of galleries is not difficult. They require only to be digged round about; and ſheered a little when there is occaſion. The chief curioſity required is in the ordering the fore part of the gallery, and in forming the arches. Each pillar of the porticoes or arches ought to be four feet diſtant from another, and the gallery 12 feet high and 10 feet wide, that there may be room for two or three perſons to walk abreaſt. When the hornbeams are grown to the height of three feet, the diſtance of the pillars well regulated, and the ground work of the gallery finiſhed, the next thing to be done is to form the frontiſpiece; to perform which, you muſt ſtop the hornbeam between two pillars for that purpoſe, which forms the arch. As it grows, you muſt with your ſheers cut off thoſe boughs which outſhoot the others. In time they will grow ſtrong, and may be kept in form by the ſheers. Portico galleries may be covered with lime trees.

GALLERY,

Gallery, Galley.

GALLERY, in *Architecture*, a covered place in a houſe, much longer than broad, and uſually in the wings of a building, its uſe being chiefly to walk in.

GALLERY, in *Fortification*, a covered walk acroſs the ditch of a town, made of ſtrong beams covered over with planks, and loaded with earth: ſometimes it is covered with raw hides, to defend it from the artificial fires of the beſieged.

GALLERY of a Mine, is a narrow paſſage or branch of a mine carried on under ground to a work deſigned to be blown up. See MINE.

GALLERY, in a ſhip, that beautiful frame, which is made in the form of a balcony, at the ſtern of a ſhip without board; into which there is a paſſage out of the admiral's or captain's cabin, and is for the ornament of the ſhip.

GALLEY, a kind of low flat built veſſel, furniſhed with one deck, and navigated with ſails and oars, particularly in the Mediterrancan. By the Greek authors under the eaſtern empire, this kind of veſſel was called γαλαια and γαλεα; and by the Latin authors of the ſame time, *galea*; whence, according to ſome, the modern denomination. Some ſay it was called *galea*, on account of a caſque or helmet which is carried on its prow, as Ovid atteſts, *de Triſtibus*. The French call it *galere*; by reaſon, they ſay, that the top of the maſt is uſually cut in the form of a hat, which the Italians call *galero*. Others derive both *galea*, and *galere*, from a fiſh by the Greeks called γαλεωτης or ξιφιας, and by us the *ſword fiſh*, which this veſſel reſembles. Laſtly, Others derive the *galley*, *galea*, *galere*, *galeaſſe*, &c. from the Syriac and Chaldee *gaul*, and *galin*, a man expoſed on the water in a veſſel of wood.

The largeſt ſort of theſe veſſels is employed only by the Venetians. They are commonly 162 feet long above, and 133 feet by the keel; 32 feet wide, with 23 feet length of ſtern poſt. They are furniſhed with three maſts, and 32 banks of oars; every bank containing two oars, and every oar being managed by ſix or ſeven ſlaves, who are uſually chained thereto. In the fore part they have three little batteries of cannon, of which the loweſt is of two 36 pounders, the ſecond of two 24 pounders, and the uppermoſt of two 2 pounders: three 18 pounders are alſo planted on each quarter. The complement of men for one of theſe galleys is 1000 or 1200. They are eſteemed extremely convenient for bombarding or making a deſcent upon an enemy's coaſt, as drawing but little water; and having by their oars frequently the advantage of a ſhip of war, in light winds or calms, by cannonading the latter near the ſurface of the water; by ſcouring her whole length with their ſhot, and at the ſame time keeping on her quarter or bow, ſo as to be out of the direction of her cannon.

The galleys next in ſize to theſe, which are alſo called *half galleys*, are from 120 to 130 feet long, 18 feet broad, and nine or ten feet deep. They have two maſts which may be ſtruck at pleaſure; and are furniſhed with two large lateen ſails, and five pieces of cannon. They have commonly 25 banks of oars, as deſcribed above. A ſize ſtill leſs than theſe are called *quarter galleys*, carrying from 12 to 16 banks of oars. There are very few galleys now beſides thoſe in the Mediterranean, which are found by experience to be of little utility except in fine weather; a circumſtance which renders their ſervice extremely precarious. They generally keep cloſe under the ſhore, but ſometimes venture out to ſea to perform a ſummer cruiſe. Galley, Galli.

GALLEY-Worm, in *Zoology*. See IULUS, ENTOMOLOGY *Index*.

GALLI, in antiquity, a name given to the prieſts of Cybele, from the river Gallus in Phrygia; but of the etymology of the name we have no certain account. All that we learn with certainty about them is, that they were eunuchs and Phrygians, and that in their ſolemn proceſſions they danced, bawled, drummed, cut and ſlaſhed themſelves, played upon timbrels, pipes, cymbals, &c. and driving about an aſs loaded with the ſacred rites and trumpery of their goddeſs. When a young man was to be initiated, he was to throw off his clothes, run crying aloud into the midſt of their troop, and there draw a ſword and caſtrate himſelf; after this he was to run into the ſtreet with the parts cut off, in his hand, throw them into ſome houſe, and in the ſame houſe put on a woman's dreſs.

Theſe prieſts had the names alſo of *Curetes Corybantes*, and *Dactyli*. The chief prieſt was called *Archi-Gallus*. This order of prieſthood is found both amongſt the Greeks and Romans. See an account of them in *Lucret.* lib. ii. and *Juv.* Sat. vi.

GALLI, the *Gauls*. See GALLIA and GAULS.

GALLI, five ſmall deſolate iſlands on the coaſt of the Principato Citra of Naples. They are ſuppoſed to be the Syrenuſæ, or iſlands once inhabited by the Sirens, which Ulyſſes paſſed with ſo much caution and hazard. Great revolutions, however, have been occaſioned in their ſhape, ſize, and number, by the effects of ſubterranean fire; and ſome learned perſons go ſo far as to aſſert, that theſe rocks have riſen from the bottom of the ſea ſince Homer ſang his rhapſodies; conſequently, that thoſe monſters dwelt on ſome other ſpot, probably Sicily or Capri. The tradition of Sirens reſiding hereabouts is very ancient and univerſally admitted; but what they really were, diveſted of their fabulous and poetical diſguiſe, it is not eaſy to diſcover. See SIREN.

The Sirenuſæ were only three in number; and therefore if theſe and the Galli be the ſame, two more muſt have ſince riſen, or the three have been ſplit into five by a ſubterraneous convulſion. On the largeſt is a watch-tower, and the next has a deſerted hermitage. The principal iſland is only a narrow ſemicircular ridge covered with a ſhallow coat of ſoil; two other little iſlands and ſome jagged rocks juſt peeping above the waves, correſpond with this one ſo as to trace the outline of a volcanical crater. The compoſition of them all is at top a calcareous rock extremely ſhaken, tumbled, and confuſed, mixed with maſſes of breccia, diſpoſed in a moſt irregular manner; below theſe is lava, and the deeper the eye follows it the ſtronger are the marks of fire: below the ſurface of the water, and in ſome places above it, the layers are complete blocks of baſaltes. Hence it is preſumed by ſome that central fires have heaved up to light the torrefied ſubſtances that originally lay near their focus, with all the intermediate ſtrata that covered them from the ſea. The layers incline downwards from eaſt to weſt; the air ſeems to have forced its way into part of the maſs while in fuſion, and by checking its workings cauſed many large

caverns

Galli ‖ Galliard.

caverns to be left in it. Theſe iſlands are uncultivated and uninhabited ſince the old hermit of St Antonio died. Myrtle covers moſt of the ſurface.

GALLIA, a large country of Europe, called *Galatia* by the Greeks. The inhabitants were called *Galli*, *Celtæ*, *Celtiberi*, and *Celtoſcythæ*. Ancient Gaul was divided into four different parts by the Romans, called *Gallia Belgica*, *Narbonenſis*, *Aquitania*, and *Celtica*. Gallia Belgica was the largeſt province, bounded by Germany, Gallia Narbonenſis, and the German ocean; and contained the modern county of Alſace, Lorraine, Picardy, with part of the Low Countries, and of Champagne, and of the Iſle of France. Gallia Narbonenſis, which contained the provinces now called *Languedoc*, *Provence*, *Dauphiné*, *Savoy*, was bounded by the Alps and Pyrenean mountains, by Aquitania, Belgium, and the Mediterranean. Aquitania Gallia, now called the *provinces of Po tou*, *Santonge*, *Guienne*, *Berry*, *Limoſin*, *Gaſcogny*, *Auvergne*, &c. was ſituated between the Garumna, the Pyrenean mountains, and the ocean. Gallia Celtica, or Lugdunenſis, was bounded by Belgium, Gallia Narbonenſis, the Alps, and the ocean. It contained the country at preſent known by the name of *Lyonnois*, *Touraine*, *Franche Compté*, *Senenois*, *Switzerland*, and part of *Normandy*. Beſides theſe grand diviſions, there is often mention made of Gallia Ciſalpina or Citerior, Tranſalpina or Ulterior, which refers to that part of Italy which was conquered by ſome of the Gauls who croſſed the Alps. By Gallia Ciſalpina, the Romans underſtood that part of Gaul which lies in Italy, and by Tranſalpina, that which lies beyond the Alps, in regard only to the inhabitants of Rome. Gallia Ciſpadana, and Tranſpadana, is applied to a part of Italy conquered by ſome of the Gauls; and then it means the country on this ſide of the Po, or beyond the Po, with reſpect to Rome. By Gallia Togata, the Romans underſtood Ciſalpine Gaul, where the Roman gowns, *togæ*, were uſually worn. Gallia Narbonenſis was called *Braccata*, on account of the peculiar covering of the inhabitants for their thighs. The epithet of *Comata* is applied to Gallia Celtica, becauſe the people ſuffered their hair to grow to an uncommon length. The inhabitants were great warriors, and their valour overcame the Roman armies, took the city of Rome and invaded Greece in different ages. They ſpread themſelves over the greateſt part of the world. They were very ſuperſtitious in their religious ceremonies, and revered the ſacerdotal order as if they had been gods. They long maintained a bloody war againſt the Romans, and Cæſar reſided ten years in their country before he could totally ſubdue them. See GAUL.

GALLIARD, or GAGLIARDA, a ſort of dance anciently in great requeſt; conſiſting of very different motions and actions, ſometimes proceeding *terra à terra* or ſmoothly along; ſometimes capering; ſometimes along the room, and ſometimes acroſs. The word is French, *galliarde*, or rather Italian; and literally ſignifies "gay, merry, ſprightly." This dance was alſo called *Romaneſque*, becauſe brought from Rome.

Thoinot Arbeau, in his Orcheſography, deſcribes it as conſiſting of five ſteps, and five poſitions of the feet, which the dancers performed before each other, and whereof he gives us the ſcore or tablature, which is of ſix minims, and two triple times. Galliard ‖ Gallipoli.

GALLIARDA, in the Italian muſic, the name of a tune that belongs to a dance called a *Galliard*. The air of it is lively in triple time.

GALLIC ACID. See CHEMISTRY *Index*.

GALLICAN, any thing belonging to France; thus the term *Gallican church* denotes the church of France, or the aſſembly of the clergy of that kingdom.

GALLICISM, a mode of ſpeech peculiar to the French language, and contrary to the rules of grammar in other languages. With us it is uſed to denote ſuch phraſes or modes of ſpeech in Engliſh as are formed after the French idiom.

GALLINACEUS LAPIS, a gloſſy mineral ſubſtance ſuppoſed by ſome to be produced by the operation of volcanic fires; and is thought to be the *lapis obſidianus* of the ancients. See OBSIDIAN, MINERALOGY *Index*.

GALLINÆ, an order of birds. See ORNITHOLOGY *Index*.

GALLINACIOUS, an appellation given to the birds of the order of the gallinæ.

GALLING, or EXCORIATION, in *Medicine*. See EXCORIATION.

GALLING of a Horſe's Back, a diſorder occaſioned by heat, and the chafing or pinching of the ſaddle.

In order to prevent it, ſome take a hind's ſkin well garniſhed with hair, and fit it neatly under the pannel of the ſaddle, ſo that the hairy ſide may be next the horſe.

When a horſe's back is galled upon a journey, take out a little of the ſtuffing of the pannel over the ſwelling, and ſew a piece of ſoft white leather on the inſide of the pannel: anoint the part with ſalt butter, and every evening wipe it clean, rubbing it till it grow ſoft, anointing it again with butter, or, for want of that, with greaſe: waſh the ſwelling, or hurt, every evening with cold water and ſoap; and ſtrew it with ſalt, which ſhould be left on till the horſe be ſaddled in the morning.

GALLINULE. See FULICA, ORNITHOLOGY *Index*.

GALLIPOLI, a ſea-port town of Italy, in the kingdom of Naples, and in the Terra-di-Otranto, with a biſhop's ſee. It ſtands on a rocky iſland, joined to the continent by a bridge. From the remoteſt antiquity this was a ſtation ſo favourable to commerce, that every maritime power wiſhed to ſecure it; and it is a reproach to government, that nothing has been done to improve its natural advantages: at preſent, Mr Swinburne informs us, it has neither harbour nor ſhelter for ſhipping. Charles II. demoliſhed Gallipoli for its adherence to Frederick of Arragon. The Venetians treated it with great cruelty in the 15th century: and in 1481 it was pillaged by the Turks. To preſerve it from future calamities, Charles V. repaired and ſtrengthened its fortifications; and, ſince that period, it has enjoyed the benefits of peace and trade, which have rendered it the moſt opulent and gayeſt town upon the coaſt, though its inhabitants do not exceed 6000 in number. Conſumptions and ſpitting of blood are rather frequent here, occaſioned by the great ſubtility of the air, which is ventilated from every quarter. The buildings are tolerable, and ſome of

Gallipoli || Gallois.

of the churches have good paintings. The cotton trade brings in about 30,000 ducats a-year. Good muſlins, cotton ſtockings, and other parts of apparel, are manufactured here, and purchaſed by the Provençals; for Gallipoli has no direct trade with the metropolis. Silk and ſaffron were formerly objects of traffic; but heavy duties and oppreſſion have cauſed them to be abandoned. The wine of this territory is good; but from dryneſs of climate, and ſhallowneſs of ſoil, the vintage frequently fails in quantity; and then the Gallipolitans have recourſe to Sicily for a ſupply. Oil is the great ſupport of the place: two thirds of the produce of its olive plantations are exported to France, and the north of Italy; the remainder is ſent to Naples, and other ports of the kingdom. Neapolitan merchants, by means of agents ſettled at Gallipoli, buy up the oils, from year to year, long before an olive appears upon the tree; and the price is afterwards ſettled by public authority. The Neapolitans ſell their oil to the merchants of Leghorn; and, if faithfully ſerved by their factors in Terra di Otranto, ought to double their capital in two years. But, to balance this advantage, they run great riſks, pay exorbitant intereſt, and have frequent bankruptcies to guard againſt. E. Long. 15. 28. N. Lat. 40. 29.

GALLIPOLI, a ſea-port town of Turkey in Europe, in the province of Romania, ſeated at the mouth of the ſea of Marmora, with a good harbour, and a biſhop's ſee. It contains about 10,000 Turks, 3500 Greeks, beſides a great number of Jews. The bazar or bezeſtein, the place where merchandiſes are ſold, is a handſome ſtructure, with domes covered with lead. It is an open place, and has no other defence than a paltry ſquare caſtle. The houſes of the Greeks and Jews have doors not above three feet and a half high, to prevent the Turks riding into their houſes. E. Long. 26. 44. N. Lat. 40. 24.

GALLIUM. See GALIUM, BOTANY *Index*.

GALLO, an iſland of the South ſea, near the ſea-coaſt of Peru, in South America, which was the firſt place poſſeſſed by the Spaniards when they attempted the conqueſt of Peru; it is alſo the place where the bucaniers uſed to come for wood and water, and to refit their veſſels when they were in theſe parts. W. Long. 88. 0. N. Lat. 2. 30.

GALLO-Græcia, a country of Aſia Minor, near Bithynia and Cappadocia. It was inhabited by a colony of Gauls, who aſſumed the name of *Gallogræci* becauſe a number of Greeks had accompanied them in their emigration. See GALATIA.

GALLOIS, JOHN, born at Paris in 1632, was an univerſal ſcholar, but chiefly noted for having been, in conjunction with M. de Sallo who formed the plan, the firſt publiſher of the *Journal des Sçavans*. The firſt journal was publiſhed January 5. 1665; but theſe gentlemen criticiſed new works ſo rigorouſly, that the whole tribe of authors united and cried it down. De Sallo declined entirely after the publication of the third number: but Gallois ventured to ſend out a fourth, on January 4. 1666; though not without a moſt humble advertiſement at the beginning, wherein it was declared, that the author "would not preſume to criticiſe, but ſimply give an account of the books." This, with the protection of M. Colbert, who was greatly taken with the work, gradually reconciled the public to it: and thus began literary journals, which have been continued from that time to this, under various titles, and by various writers. Gallois continued his journal to the year 1674, when more important occupations obliged him to turn it over to other hands. M. Colbert had taken him into his houſe to teach him Latin; and when he loſt his patron in 1683, he was firſt made librarian to the king, and then Greek profeſſor in the royal college. He died in 1707.

Gallois || Gallows.

GALLON, a meaſure of capacity both for dry and liquid things, containing four quarts. But theſe quarts, and conſequently the gallon itſelf, are different, according to the quality of the things meaſured: For inſtance, the wine gallon contains 231 cubic inches, and holds eight pounds avoirdupois of pure water; the beer and ale gallon contains 282 ſolid inches, and holds ten pounds three ounces and a quarter avoirdupois of water; and the gallon for corn, meal, &c. $272\frac{1}{4}$ cubic inches, and holds nine pounds thirteen ounces of pure water.

GALLOP, in the manege, is the ſwifteſt natural pace of a horſe, performed by reaches or leaps; the two fore feet being raiſed almoſt at the ſame time; and when theſe are in the air, and juſt ready to touch the ground again, the two hind feet are lifted almoſt at once. The word is borrowed from the barbarous Latin *calupare*, or *calpare*, "to run." Some derive it from *caballicare*; others from the Greek καλπαζειν, *to ſpur a horſe*.

GALLOPER, in artillery, is the name of a carriage which ſerves for a pound and a half gun. This carriage has ſhafts ſo as to be drawn without a limber, and is thought by ſome to be more convenient and preferable to other field carriages; and it may likewiſe ſerve for our light three and ſix pounders.

GALLOWAY, a county of Scotland, which gives the title of Earl to a branch of the noble family of Stuart. It is divided into two diſtricts; the weſtern, called *Upper Galloway*, being the ſame with Wigtonſhire; and the eaſtern, or ſtewartry of Kirkcudbright, called *Lower Galloway*. See KIRKCUDBRIGHT and WIGTONSHIRE.

MULL of Galloway, the moſt ſoutherly cape or promontory of Scotland, in the county of Galloway, and on the Iriſh ſea.

GALLOWAYS is the name of a peculiar ſort of horſes, ſo called from the county of Galloway in Scotland, where they are bred. Tradition reports that this kind of horſes ſprang from ſome Spaniſh ſtallions, which ſwam on ſhore from ſome of the ſhips of the famous Spaniſh armada, wrecked on the coaſt; and coupling with the mares of the country, furniſhed the kingdom with their poſterity. They were much eſteemed, and of a middling ſize, ſtrong, active, nervous, and hardy.

GALLOWS, an inſtrument of puniſhment, whereon perſons convicted capitally of felony, &c. are executed by hanging.

Among our anceſtors it was called *furca*, "fork;" a name by which it is ſtill denominated abroad, particularly in France and Italy. In this latter country, the reaſon of the name ſtill ſubſiſts; the gallows being a real fork driven into the ground, acroſs the legs whereof

Gallows || Galvani.

whereof is laid a beam, to which the rope is tied. See FURCA.

GALLUS, CORNELIUS, an ancient Roman poet, born at Forum Julium, now called *Frejus* in France. He was a particular favourite with Auguſtus Cæſar, who made him governor of Egypt: but his maladminiſtration there occaſioned his baniſhment, and the loſs of his eſtate; for grief of which he put an end to his own life. He wrote four books of love elegies; and Virgil has complimented him in many places.

GALLUS, or *Cock*. See PHASIANUS, ORNITHOLOGY *Index*.

GALLY, in printing, a frame into which the compoſitor empties the lines out of his compoſing-ſtick, and in which he ties up the page when it is completed.

The gally is formed of an oblong ſquare board, with a ledge on three ſides, and a groove to admit a falſe bottom called a *gally ſlice*.

GALVANI, LEWIS, was born at Bologna in Italy, in the year 1737. There many of his relations had arrived at diſtinguiſhed eminence in juriſprudence and divinity, and he himſelf had the honour of giving his name to a ſuppoſed new principle in nature, which of conſequence is called *Galvaniſm*, although this great man gave it the name of *animal electricity*. From a boy he became enamoured of the greateſt auſterities of the Catholic religion, and joined himſelf to a convent, the monks of which were celebrated for their attachment to the ſolemn duty of viſiting the dying. He wiſhed much to become a member of this order, but was prevailed on to relinquiſh the idea by one of the brotherhood, after which he turned his whole attention to the ſtudy of medicine in its various branches. He ſtudied under Beccari, Tacconi, Galli, and in a particular manner Galleazzi, who took him into his own houſe; and he afterwards became his ſon-in-law. He acquired great reputation by his inaugural theſis, *De Oſſibus*, in 1762, and was ſoon after choſen public lecturer in the univerſity of Bologna, and reader in anatomy to the inſtitute of that city. So much admired was his talent for lecturing, that vaſt numbers conſtantly attended him; and he employed his few leiſure hours in making experiments, and in the uſeful ſtudy of comparative anatomy. We find in the Memoirs of the Inſtitute of Bologna, a number of curious obſervations on the urinary organs, and on the organs of hearing in birds.

Soon after his anatomical and phyſiological knowledge was fully eſtabliſhed throughout the Italian ſchools, a mere accident led him to that intereſting diſcovery which will tranſmit his name with honour to the lateſt poſterity. His amiable wife, for whom he cheriſhed the moſt ardent love, and with whom he had been united for a number of years, was in a declining ſtate of health, and was uſing a ſoup of frogs by way of reſtorative. Some of theſe animals being ſkinned for this purpoſe, were lying on a table in Galvini's laboratory, where alſo ſtood an electrical machine. One of thoſe who aſſiſted him in conducting his experiments, unintentionally brought the point of a ſcalpel near the crural nerves of a frog which lay near the conductor, when the muſcles of the limb were very ſtrongly convulſed. Madame Galvani, who was a woman of a penetrating underſtanding, and a lover of ſcience, happened to witneſs the phenomena, of which ſhe inſtantly informed her huſband. On his arrival he repeated the experiment, and diſcovered that the convulſions only happened when the ſcalpel was in contact with the nerve, and a ſpark was drawn from the conductor at the ſame time. After an almoſt endleſs variety of experiments, conducted with great ingenuity, which it would be foreign to the deſign of this article to enumerate here, he concluded that all animals have within them an electricity of a peculiar nature; that this fluid is contained in moſt parts, but is moſt apparent in the nerves and muſcles; that it is ſecreted by the brain, and diffuſed by the nerves through various parts of the body. Galvani.

He compared each muſcular fibre to a ſmall Leyden phial, and attempted to explain the phenomena of muſcular motion by analogies taken from that inſtrument. He firſt thought of its pathological influence in regard to rheumatic, convulſive, paralytic, and other nervous affections. His firſt publication on this grand diſcovery was entitled *Aloyſii Galvani de viribus Electricitatis in Motu Muſculari Commentarius*, which made its appearance in 4to, in the year 1791, and was printed for the Inſtitute of Bologna. By this work the attention of philoſophers both in Italy and other countries was inſtantly rouſed, and it was ſoon followed by numerous publications, in ſome of which the ſentiments of Galvani were defended, and in others they were oppoſed. The celebrated Volta turned his attention to the ſubject, and adduced a number of arguments to prove that Galvani's opinion reſpecting animal electricity was erroneous, deriving the phenomena from the electric matter of the atmoſphere, and allowing the nerves and muſcles no higher place than that of the moſt ſenſible teſts hitherto diſcovered. The doctrine of Volta received many admirers and advocates; yet there are ſtill numbers to be met with in the learned world who ſupport the ſentiments of Galvani, who ſtill adhere to his original theory, in the defence of which he diſplayed much candour and modeſty, as well as ingenuity, by which he may be juſtly conſidered as deſerving that diſtinguiſhed place among the experimental philoſophers, which the union of his name with the moſt intereſting natural phenomena will probably ſecure to him for ever. See GALVANISM.

Theſe important inquiries, joined to the duties of his office as a profeſſor, and his extenſive practice in the capacity of ſurgeon and man-midwife (*accoucheur*), in both which he eminently excelled, afforded abundant ſcope for his indefatigable induſtry. He compoſed a variety of memoirs on topics connected with his profeſſion; but theſe, as far as we know, have never been publiſhed. He delighted to converſe with men of ſcience, in whoſe company new publications were read, and their merits inveſtigated, which was certainly a valuable ſource of intellectual improvement.

The character of Galvani in private life is allowed to have been moſt amiable; and his ſenſibility, which was naturally ſtrong, received a violent ſhock in the death of his amiable wife, in the year 1790. This event brought upon him the moſt alarming melancholy, which he even delighted to encourage, by viſiting her tomb in the nunnery of St Catharine, and pouring forth his unavailing lamentations over her grave. He was ever punctual in the diſcharge of the duties of his religion, even

Galvani. even to the minuteſt rite, as he never loſt the pious impreſſions which were made upon his mind at an early period of life. To this cauſe we may probably trace back his determination never to take what was called the civic oath of allegiance to the Ciſalpine republic, for which he was barbarouſly deprived of all his offices and dignities. Devoured by melancholy, and nearly reduced to a ſtate of indigence, he took up his reſidence in the houſe of his brother James, a man of reſpectability, where he fell into a ſtate of extenuation and debility. At this time even *republican* governors appear to have been aſhamed of their brutal conduct towards ſuch an extraordinary man; in conſequence of which a decree was paſſed for reſtoring him to his chair in the univerſity, together with its emoluments; but this fit of generoſity was too long in ſeizing them. He departed this life on the 5th of November, 1798, in the 61ſt year of his age, amidſt the tears of his friends, and the regret of the public, in whoſe death the learned world has been deprived of one of its brighteſt ornaments. Galvani.

GALVANISM.

1 Experiments ſhewing

IF two pieces of metal, the one of zinc, and the other of ſilver, or the one of zinc and the other of copper, or, what anſwers the purpoſe equally well, a penny piece and a half crown piece, be ſo placed that the one ſhall touch the upper ſurface of the tongue, and the other ſhall touch its under ſurface, while the edges project over the point; as often as the edges of the metals in this ſituation are brought into contact, a peculiar ſenſation is produced in the tongue; there is ſomething like a ſlight ſhock of electricity, and there is perceived at the ſame time an auſtere, aſtringent, or metallic taſte.

If a bit of tin-foil be placed on one of the eyes, and a bit of copper held between the teeth or touching the tongue, and a communication be formed by means of a wire between the piece of metal on the eye and that on the tongue, a flaſh of light is ſeen, and this is produced as often as the communication is completed. But, in the above experiments, if metals of the ſame kind be employed, no perceptible effect whatever is produced.

If a pile compoſed of 50 or 60 pairs of plates of zinc and ſilver, or zinc and copper, be arranged in a regular ſeries, with pieces of cloth moiſtened in a ſolution of common ſalt placed between each pair; and if one hand previouſly moiſtened with water touch the lower pair, and the other hand, alſo moiſtened, touch the upper pair of plates, the moment the communication between the bottom and top of the pile is completed, a ſmart ſhock is felt; and if 50 or 60 pairs of plates of copper and zinc be arranged in a trough as will be afterwards deſcribed, and the ſpaces between the pairs be filled with water, to which about $\frac{1}{16}$th of pretty ſtrong nitric acid has been added, a ſimilar ſhock is perceived, when the hands wetted with water touch the plates at the extremities of the trough. If a communication by means of wires and two pieces of well-prepared charcoal be made between the extremities of the trough, a very brilliant combuſtion is excited every time the two pieces of charcoal are brought into contact. By placing tin-foil, gold leaf, white or yellow Dutch metal or braſs leaf, on a wire connected with one end of the trough, and touching the metallic leaves with a plate of copper or zinc connected with a wire from the other end of the trough, a rapid and brilliant deflagration is exhibited every time that the communication is effected.

2 what is underſtood by galvaniſm.

The phenomena which are thus produced have received the name of *Galvaniſm*, from the name of Galvani, who firſt obſerved and publiſhed an account of ſome of them, and the power by which theſe effects are produced has been denominated the *galvanic power* or *fluid*. From its effects on animals being ſimilar to thoſe of the electrical fluid, it was at firſt called *animal electricity*; but then the knowledge of galvaniſm was limited to its effects on animals, and it was ſuppoſed to depend on ſomething peculiar to animal life.

In the following treatiſe we propoſe to give a view of the progreſs and preſent ſtate of galvaniſm; and for this purpoſe we ſhall arrange the whole under two great diviſions. Under the firſt, we ſhall conſider the phenomena of galvaniſm, or detail the facts which have been aſcertained with regard to this power. The ſecond part will be occupied in the hiſtory, progreſs, and theories, which have been held with regard to the nature of galvaniſm.

PART I. OF THE PHENOMENA OF GALVANISM.

3 Arrangement.

IN treating of the phenomena of galvaniſm, its progreſſive hiſtory ſuggeſts an arrangement ſufficiently convenient for taking a view of the effects of the galvanic fluid. Thoſe effects which are to be regarded as ſtrictly chemical, were altogether unknown, till after its application to animals, and a great maſs of facts relative to its effects on animal life had been accumulated. We may therefore firſt conſider the effects produced on animals by the operation of the galvanic fluid, and in the next place thoſe effects which are ſtrictly chemical. But before we proceed to this, it is neceſſary that the nature and conſtruction of the apparatus, by which theſe effects were produced, ſhould be underſtood. Theſe topics, therefore, ſhall be the ſubjects of the three following chapters. In the firſt we ſhall treat of the conſtruction of the apparatus by which the phenomena of galvaniſm are produced; the ſecond will be employed in conſidering the effects of the galvanic fluid on animals; and the third will comprehend a view of its chemical effects.

Conſtruction of Apparatus.

Chap. I. *Of the Conſtruction of the Apparatus for exhibiting the Phenomena of Galvaniſm.*

4 Apparatus at firſt ſimple.

On the firſt diſcovery of galvaniſm, the apparatus for exhibiting its effects was extremely ſimple. It conſiſted merely of two pieces of different metals, ſuch as has been deſcribed above, by which a peculiar ſenſation is produced on the tongue. This, it has been ſtated, is effected by means of a piece of zinc and a piece of copper, the one placed on the upper ſurface, and the other on the under ſurface of the tongue, while the projecting edges are brought into contact. In the ſame way, and with ſuch an apparatus, a great variety of experiments, eſpecially in cold blooded animals, were exhibited, when the knowledge of this remarkable power was firſt announced and inveſtigated.

Plate CCXXIX. fig. 1.

For the purpoſe of exhibiting ſome of the ſimpler effects of galvaniſm, we ſhall deſcribe the following apparatus, which is of very eaſy conſtruction. AB, fig. 1. is zinc wire, ſharp at the point A, and fixed in the wooden ſtand C. If the frog prepared in the way which we ſhall immediately deſcribe, be fixed on the point of the wire at A, and a gold or a ſilver wire (a ſilver tea ſpoon will anſwer the purpoſe) be brought into contact with the ſide of the wire as at the point D; and while in contact with the wire at D, it is brought into contact with the feet of the frog at E or F, the effect of the galvanic power will be immediately perceived. The limbs of the animal will be ſtrongly convulſed, and will exhibit as much motion by the contraction of the muſcles as if it were alive, and in full vigour. But if a zinc wire, ſimilar to AB, were ſubſtituted for the gold or ſilver wire, no ſuch effect would be produced.

5 Methods of preparing frogs for experiments.

Frogs, as they are moſt eaſily found, and as they are, perhaps, more convenient in other reſpects, have been oftener the ſubject of galvanic experiments than any other animal. To prepare them for theſe experiments, various methods have been followed. Some phyſiologiſts propoſe to remove only the integuments, and lay bare the muſcles, while others open the cavities of the thorax and abdomen, remove the viſcera which are contained in theſe cavities, and bring into view the nerves and muſcles which are there diſtributed. Some again, after the above previous preparation, ſeparate all the parts between the origin of the nerve and its inſertion in the muſcle, ſo that the latter may be attached by means of the nerves only, to the trunk of the body; while others, after a ſimilar preparation, cut off the animal's head, that the effects produced by galvaniſm may not be confounded with the voluntary movements of the living animal. By another mode of preparation, each of the parts is ſeparated from the body by diſſection, after laying bare the muſcles and nerves.

But in general a frog is underſtood to be prepared when it is divided with a pair of ſciſſars into two portions, through the middle of the body and ſpine. The viſcera are then removed, as well as the integuments of the inferior extremities. As the ſciatic nerves of this animal riſe very high upon the ſpine, they are diſtinctly ſeen after this treatment. When it is intended, as in ſome experiments, to arm the nerves, as it is called, a pair of ſharp-pointed ſciſſars is introduced beneath them, and the ſpine is cut through, but without dividing the nerves. A portion of the inferior part of the ſpine is afterwards to be ſeparated, that room may be left for covering the nerves with a bit of tin-foil. This is what is uſually underſtood by arming or coating the nerves. In ſome experiments it will be found more convenient to ſeparate the lower extremities from the trunk, and to employ the crural nerve.

Conſtruction of Apparatus.

Phenomena ſimilar to the above may be produced by placing a frog A prepared in the way deſcribed above, on a plate of zinc B, fig. 2. and on a plate of ſilver or copper C. If the communication between the plates A and B be completed by means of the conductor D, the muſcles of the frog are immediately thrown into ſtrong convulſions, and theſe motions are renewed as often as the contact is made by the conducting wire and the two metals.

Fig. 2.

6 Single galvanic combinations.

The apparatus we have now deſcribed affords an example of the ſimpleſt galvanic combination, or what is uſually denominated a ſingle galvanic combination. Here it may be obſerved, that this combination muſt conſiſt of three different conductors. The conductors of electricity have been arranged into two prineipal claſſes: to the firſt belong the metallic ſubſtances and charcoal, which have been otherwiſe called dry and perfect conductors; the ſecond claſs conſiſts of the imperfect conductors, which are water and other oxidating fluids, and the ſubſtances which contain theſe fluids. But although the conductors of electricity, for the ſake of conveniency, are thus arranged, they differ from each other in their conducting power, and this difference is greateſt among the ſubſtances comprehended under the ſecond claſs. Now, if the three conductors of the galvanic fluid be all of the firſt claſs, or all of the ſecond, the effect is ſcarcely perceptible. An active, ſimple galvanic combination, then, muſt conſiſt of three different bodies, one conductor muſt belong to one claſs, and two different conductors muſt be taken from the other claſs. In fig. 3. and 4. are exhibited examples of active ſimple galvanic combinations. In fig. 3. the letters AB mark the bodies belonging to the firſt claſs or perfect conductors; and *a* marks the body belonging to the ſecond claſs, or imperfect conductors; and in fig. 4. A marks one body belonging to the firſt claſs, and *a b* two bodies belonging to the ſecond claſs, or the imperfect conductors. Of the three bodies forming a galvanic combination, if two of them belong to the firſt claſs, and one to the ſecond, this combination is ſaid to be of the firſt order; but if one of the three bodies only belong to the firſt claſs, and two to the ſecond, the combination is ſaid to be of the ſecond order. Fig. 3. is a galvanic combination of the firſt order, and fig. 4. is one of the ſecond. This may be further illuſtrated by examining fig. 5, 6, 7, which conſiſt of two bodies only, and therefore are not active combinations; and alſo by examining fig. 8 and 9. which conſiſt of three bodies, but two of them are of the ſame kind, and therefore act as a ſingle body. In the laſt five figures, the capital letters denote the bodies belonging to the firſt claſs, and the ſmall letters thoſe belonging to the ſecond.

Fig. 3. and 4.

Fig. 5, 6, 7, 8, 9.

In the ſingle active galvanic combination, or the ſimple galvanic circle, the two bodies of one claſs muſt be in contact with each other in one or more points, while, at the ſame time, they are connected together at other

points

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points with the body belonging to the other claſs. Thus, if a prepared frog is convulſed by the contact of the ſame piece of metal in two different places, the fluids of thoſe parts which muſt be ſomewhat different from each other, are the two conductors of the ſecond claſs, and the metal conſtitutes the third body for the conductor of the firſt claſs. But if two metals be employed, the fluids of the prepared animal differing little from each other, are to be conſidered as one body of the ſecond claſs.

7 Action of Galvaniſm compared by Chemical Action.

Here it may be neceſſary to anticipate a little, by obſerving, that in a ſimple galvanic circle, the conductor or conductors of one claſs muſt have ſome chemical action upon the other conductor or conductors, otherwiſe no galvanic action would be produced, or at leaſt a very feeble one, from the combination of three bodies. This galvanic action, too, ſeems to be in proportion to the degree of chemical action, from which ſome have ſuppoſed, that this chemical agency is the primary cauſe of the phenomena.

It is found that the moſt active galvanic combinations, or galvanic circles belonging to the firſt order, are thoſe in which two ſolids poſſeſſing different degrees of oxidability, are combined with a fluid which is capable of oxidating at leaſt one of the ſolids. Gold, ſilver, and water, do not form an active galvanic combination, becauſe water is incapable of oxidating either of theſe metals; but if a ſmall quantity of nitric acid, or any other fluid which may be decompoſed by the ſilver, be mixed with water, an active galvanic circle may thus be formed.

If zinc, ſilver, and water, or zinc, copper, and water, be combined together, an active galvanic circle is formed, and the water will be found to oxidate the zinc, if it hold any portion of atmoſpherical air in ſolution, and ſtill more ſo, if it contain oxygen. But the combination of the ſame ſubſtances forms a much more powerful galvanic circle, if a little nitric acid be added to the water, becauſe then the fluid has a ſtrong action on the zinc, and oxidates it.

Galvanic combinations belonging to the ſecond order are found to be moſt powerful, when two conductors of the ſecond claſs have different chemical actions on the conductors of the firſt claſs, while at the ſame time they have an action upon each other. As an example of this, copper, ſilver, or lead, combined with a ſolution of an alkaline ſulphuret, and diluted nitric acid, conſtitute a very active galvanic circle.

8 Galvanic circles of the firſt order.

The following is a liſt of galvanic circles of the firſt order, compoſed of two conductors of the firſt claſs, and one of the ſecond.

Zinc with gold, or charcoal, or ſilver, or copper, or tin, or iron, or mercury; and water containing a ſmall quantity of any of the mineral acids.

Iron, with gold, or charcoal, or ſilver, or copper, or tin, and a weak ſolution of any of the mineral acids, as above.

Tin, with gold, or ſilver, or charcoal, and a weak ſolution of any of the mineral acids, as above.

Lead, with gold, or ſilver, and a weak acid ſolution, as above.

Any of the above metallic combinations, and common water, viz. water containing atmoſpherical air, or eſpecially water containing oxygen air.

Copper, with gold, or ſilver, and a ſolution of nitrate of ſilver and mercury; or the nitric acid; or the acetous acid.

Silver, with gold, and the nitric acid.

The following is a liſt of galvanic circles of the ſecond order, conſiſting of one conductor of the firſt claſs, and two of the ſecond.

9 Of the ſecond order.

Charcoal, or Copper, or Silver, or Lead, or Tin, or Iron, or Zinc,	with water, or with a ſolution of any hydrogenated alkaline ſulphurets, capable of acting on the firſt three metals only;	and a ſolution of nitrous acid, or oxygenated muriatic acid, &c. capable of acting upon all the metals.

But the effects of the galvanic fluid are extremely feeble, when they are limited to the operation of even the moſt powerful ſimple combinations. In the progreſs of the knowledge of galvaniſm it was ſoon found, that theſe effects might be combined and increaſed to almoſt any degree. This is done by connecting together a number of active ſimple combinations, which, it is to be obſerved, muſt be ſo diſpoſed that they may not counteract each other. A number of ſimple combinations thus connected together have received the name of *batteries;* and theſe batteries are ſaid to belong to the firſt or ſecond order, according as the ſimple combinations of which they are formed, are compoſed of ſubſtances of the firſt or ſecond order of conducting powers. Thus, for example, if a plate of zinc be laid upon a plate of copper, and a piece of moiſtened card or leather be laid upon the zinc, and a ſimilar arrangement of three other pieces be laid upon the firſt, and any number of combinations of the ſame kind be continued, taking care that they are always arranged in the ſame order, the whole will form a battery of the firſt order. But if a plate of copper be connected with a piece of cloth moiſtened with water, and the latter with another piece of cloth, moiſtened with a ſolution of ſulphuret of potaſh, and this be connected with another piece of copper, repeating the ſame ſeries to any convenient number, a battery of the ſecond order will be formed of the whole.

10 Batteries.

Batteries of the ſecond order have been arranged by Mr Davy into the three following claſſes. 1. The moſt feeble battery is compoſed, when ſingle metallic plates are ſo arranged that two of their ſurfaces or oppoſite extremities are in contact with different fluids, the one of which is capable, and the other is incapable, of oxidating the metal, a regular ſeries of ſuch combinations are formed. 2. When ſingle combinations or elements of the ſeries are each compoſed of a ſingle plate of a metallic ſubſtance, capable of acting upon ſulphurated hydrogen, or upon ſulphurets diſſolved in water, accompanied with portions of a ſolution of ſulphuret of potaſh on one ſide, and water on the other. 3. The third claſs is the moſt powerful, being formed when metallic ſubſtanees oxidable in acids, and capable of acting on ſolutions of ſulphurets, are connected as plates with oxidating fluids, and ſolutions of ſulphuret of potaſh, and ſo arranged that the oppoſite ſides of every plate may undergo different chemical changes, the mode of alternation being regular.

11 Couronne de taſſes.

The firſt attempt to increaſe the effects of the galvanic fluid, by combining a ſeries of ſimple circles, was made by Volta; to this he gave the name *couronne de taſſes*

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Fig. 10.

taſſes. The following is the conſtruction and mode of applying this apparatus.

Take any number of cups or glaſs tumblers A, B, C, D, E, fig. 10. Fill them about three-fourths full with any of the ſaline ſolutions, which will be afterwards deſcribed, as that of common ſalt or ſal ammoniac in water. To one extremity of a bent braſs wire ſolder a plate of zinc of about two inches in diameter, and to the other extremity of the ſame wire, ſolder in the ſame manner a plate of copper of the ſame diameter. Theſe connecting wires are repreſented in the figure by the letters *a*, *a*, *a*, *a*; and the plates of the different metals are marked with the letters Z and C, viz. zinc and copper. In arranging the plates in the veſſels, it ought to be obſerved, that a plate of zinc and a plate of copper belonging to different wires, muſt be in the ſame veſſel, and never two plates of the ſame kind. Thus in the firſt veſſel A, there is a plate of copper; in the ſecond B, connected by the ſame wire, there is a plate of zinc; in the ſame veſſel B, there is alſo a plate of copper, which is connected by means of another wire to a plate of zinc in the third veſſel C. The ſame order and arrangement are to be obſerved to whatever number of plates and veſſels the ſeries may extend.

Suppoſe now that the apparatus has been arranged in the way deſcribed above, and the veſſels have been filled with a ſolution of common ſalt in water; if the number of veſſels be not leſs than ten or twelve, a ſlight ſhock will be felt by immerſing one hand in the veſſel, at one extremity of the ſeries, and the other hand in the veſſel at the other extremity; as for inſtance, by putting the fingers of one hand in the veſſel A, fig. 10. and ſuddenly plunging the fingers of the other hand in the veſſel E. The ſhock will perhaps be more ſenſibly felt by previouſly wetting the palms of both hands, and taking a ſilver or pewter ſpoon in each hand, immerſe the handle of the one into the veſſel A, and the handle of the other into the veſſel E.

The ſtrength of this apparatus depends on the number of ſeries of plates and veſſels employed. But it is obvious that this ſeries, from the nature of the apparatus, could not be greatly extended, ſo as to afford any great increaſe of power. This occurred very early to the ingenious diſcoverer, as an inſurmountable objection to the uſe of this apparatus. The views of this philoſopher in inveſtigating the nature of galvaniſm, ſeem at this time to have been chiefly directed to the diſcovery of inſtruments or apparatus, by means of which he might be enabled to augment its power. In the proſecution of his inquiries, therefore, he contrived another apparatus, which was afterwards known by the name of the galvanic pile, and ſometimes, but more rarely by that of the voltaic pile or pile of Volta, from the name of the diſcoverer. This apparatus is conſtructed in the following manner.

12 Pile of Volta.

A pile of moderate ſtrength may be conſtructed of 60 pairs of plates of zinc and copper, each plate being about two inches diameter; it may be conſtructed alſo with ſimilar plates of zinc and ſilver, or of almoſt any two other diſſimilar metals. Such piles have been very conveniently conſtructed, with half crown pieces and plates of zinc of the ſame ſize, or more conveniently with penny pieces and plates of zinc of the ſame diameter. But of whatever different metals this kind of apparatus is to be conſtructed, the ſame order of arrangement is to be obſerved throughout the whole ſeries.

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Suppoſe the metals to be employed in the conſtruction of the pile are zinc and copper, (and theſe from views of œconomy have been moſt frequently employed), an equal number of pieces of cloth, paſteboard, or leather, of the ſame diameter with the metallic plates, is to be prepared. The uſe of theſe pieces of cloth is to retain the moiſture, by means of which the communication between the plates is formed, and the galvanic combinations are completed; and in proportion to the length of time during which the pieces of cloth or other ſubſtances retain the fluid which they have abſorbed, the operation of the pile continues. The pile is formed by placing a pair of plates, one of zinc, and one of copper, upon a ſtand, the one immediately above the other. Upon this pair of plates is then placed a piece of cloth which has been ſoaked in ſome ſaline ſolution, as that of common ſalt, or ſal ammoniac. Upon this piece of cloth is placed another pair of plates, arranged in the ſame order as the firſt pair. It makes no difference which of the metals is placed firſt in the ſeries, only it is neceſſary to take care that the ſame order be preſerved throughout the whole pile. If the ſeries, for inſtance, begins with copper, it runs in the following order: copper, zinc, cloth; copper, zinc, cloth, &c. to whatever number of pairs of plates and pieces of cloth the ſeries may extend.

But if the number of ſeries amount to 60 pairs, it will be neceſſary to have rods to confine the pairs of plates, and to retain them in a perpendicular column; for without this the weight at top would be ſo conſiderable that the leaſt inclination to one ſide (and this could not well be avoided) would derange the whole apparatus. The rods which have been employed for this purpoſe have been ſometimes made of glaſs, and ſometimes of wood. When wood is uſed, it ſhould be pretty dry, or baked, by which means its conducting power is either greatly diminiſhed or entirely deſtroyed.

The pile being conſtructed in this manner, its effects may be obſerved, by applying the fingers of one hand moiſtened with water to the loweſt pair of plates, and then touching with the fingers of the other hand, moiſtened in the ſame manner, the upper pair of plates, thus completing the communication between the extremities of the pile. Every time that this communication is made, a ſenſation is experienced, ſimilar to a ſlight ſhock of electricity. The intenſity of this ſhock is in proportion to the number of the pairs of plates, the nature of the fluid employed, and the care with which the pile has been erected, or the time that it has continued in action. With a pile of 60 pairs of plates, the ſhock will be perceptible through the fingers, or the whole of the hand, and in ſome perſons, when it is in full activity, it will extend as high as the elbows.

In making experiments with this kind of apparatus, it will be found that 50 or 60 pairs of plates will be a ſufficient number to be erected in one pile; but to increaſe the power of the galvanic fluid, a number of piles may be connected together. This may be done in two ways; either by combining the ſeparate action of the different piles employed; as, for inſtance, if three piles are conſtructed, let the pairs of plates be arranged in

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in each exactly in the same way, and let the conducting substances, as wires, pass from the top and bottom of each to one common conductor. In this case we have the action of three different currents of the galvanic fluid; but whatever number of piles may be employed, their mutual action may be so combined, that the whole effect may be produced by one single current. Suppose the metallic plates of one pile are arranged in the following order; copper, zinc, cloth; copper, zinc, cloth, &c.: then the plates of the second must be arranged in a different order, namely zinc, copper, cloth; zinc, copper, cloth, &c. and the plates of the third in the same way as the first, viz. copper, zinc, cloth; copper, zinc, cloth, &c. The three piles being thus arranged, let a metallic conductor, as a slip of copper or zinc, be placed between the tops of the first and second pile, and a similar conductor be placed between the bottom of the second and third piles; and when they are thus connected together, let the fingers of one hand, moistened, be placed at the lowest pair of plates of the first pile, and the fingers of the other hand, also moistened, be brought in contact with the upper pair of plates of the third, a violent shock will be felt. The shock will be the same as if the whole number of pairs of plates of which the three piles are composed were formed into a single pile; for the same order of arrangement being observed from the bottom of the first pile to the top, and from the top of the second pile to the bottom, and again from the bottom of the third pile to the top, the current passes uninterruptedly through the whole series, as if it were uniformly arranged in one pile.

The effects of this apparatus may be farther observed in its chemical action. If the circle is completed, or the communication between the extremities of the apparatus by means of charcoal be formed, a spark is produced. This is done by attaching a piece of well prepared charcoal to a wire which communicates with one extremity of the apparatus, and another similar piece of charcoal to another wire communicating with the other extremity; if the two pieces of charcoal be brought into contact, thus completing the circle, a spark will be observed, and this may be repeated as long as the activity of the pile continues. The chemical effects of such an apparatus are also exhibited in the decomposition of water. The apparatus for effecting this decomposition, and the method of using it, will be afterwards described.

But it was soon found that the effects of this pile, although when it is first erected it possesses considerable energy, in a very short time it becomes extremely feeble, and at last altogether imperceptible. This is owing to the pieces of cloth or other substance which is interposed between the pairs of plates being deprived of their moisture, either by evaporation, or by being squeezed out, from the weight of the plates. The latter effect, it is obvious, must be in proportion to the height, and consequently the incumbent pressure of the upper on the lower part of the pile; and besides this, the liquid as it oozes out, trickles down the sides of the pile, so that the different pairs of plates are less perfectly insulated than they otherwise ought to be, to produce the full effect.

Various contrivances were thought of to obviate these inconveniences, and the first which was proposed was announced by the ingenious inventor of the pile himself. Volta inclosed his piles, after they were erected, with wax or pitch. By this contrivance which he put in practice on two columns or piles, each consisting of 20 plates, he succeeded so far in preventing the inconveniences alluded to above, that their effects continued nearly undiminished for several weeks. By other contrivances the plates and pieces of cloth or pasteboard were arranged horizontally, by which means some of the inconveniences of the upright column were avoided; among these the unequal pressure was removed, but still it was found that the evaporation continued, so that it was not long before its operation began to diminish, and at last to be entirely interrupted.

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As it was found that the chemical effects of the pile were greatly increased by employing plates of a larger surface, even when the number was greatly diminished, piles were erected both on the continent and in Britain, with plates from 10 to 14 inches square. Twelve or fourteen pairs of plates of the above size, arranged in the same way as those which have been already described, produced very considerable chemical effects, such as burning phosphorus, setting fire to gunpowder, and deflagrating gold and silver leaf. The pieces of thick cloth or pasteboard moistened with water, to which a certain proportion of nitric acid was added, were usually employed in the construction of this pile; but it is unnecessary to mention that it was attended with similar inconveniences to those which accompanied the smaller pile. These inconveniences probably led to another and more effectual contrivance for exhibiting the effects of galvanism. But before we give an account of these, we shall farther illustrate the nature and construction of the pile with an explanation of fig. 11. and 12.

Fig. 11. is a representation of a pile composed of copper, zinc, and pieces of pasteboard, soaked in some saline solution. The pile is erected on the stand A, and the different parts of which it is composed are retained in their perpendicular position by means of the three rods made of glass or baked wood, *b*, *b*, *b*. The pieces of metal are marked *c*, *z*, and the pasteboard *p*, in the order in which they are placed. The pile being erected from bottom to top in the same order, let a piece of wire *e* be inserted under the lower pair of plates, and let another wire *f*, be kept in contact with the upper surface of the upper pair of plates; the different parts being thus disposed, if the fingers of one hand moistened be brought in contact with the wire *e*, and the fingers of the other hand, also moistened, be brought in contact with the wire *f*, a shock will be felt, and thus it will be found that the energy of the pile will continue till the moisture of the pieces of pasteboard has evaporated, or the peculiar change which takes place on one of the metals during its action, and which will be taken notice of afterwards, has been effected. Fig. 11.

Fig. 12. exhibits a view of a combination of three piles, A, B, C. In the column A the arrangement is copper, zinc, pasteboard; copper, zinc, pasteboard, &c.: in the column A, this arrangement is reversed, from the bottom of the column, which is zinc, copper, pasteboard; zinc, copper, pasteboard, &c.; because it must be the same as if the column B were placed upon the top of the column A, the points A and B being brought Fig. 12.

into

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into contact, only having a piece of paſteboard interpoſed. The third column C is arranged in the ſame manner as the column A, viz. copper, zinc, paſteboard; copper, zinc, paſteboard, &c. Thus, then, the three columns are ſo arranged, that the different ſeries ſucceed each other from the bottom of column A to the top, from the top of column B to the bottom, and from the bottom of column C to the top, as if the whole had been diſpoſed in one column A. A communication is then formed between the top of the column A and the top of column B, by a metallic conductor D, and between the bottom of column B, and the bottom of column C, by means of the metallic conductor E. If then the fingers of one hand moiſtened are brought into contact with the wire F, which communicates with the bottom of column A, and the fingers of the other hand alſo moiſtened are brought into contact with the wire G, a ſmart ſhock will be felt, from the combined action of the three columns or piles.

The inconveniences of the pile, as we have already hinted, were ſoon felt by thoſe who were eager in the inveſtigation of galvaniſm, and who wiſhed their experiments to continue with undiminiſhed energy, that they might be enabled to aſcertain with preciſion the new and curious facts which preſented themſelves. Theſe inconveniences, it is very probable, ſuggeſted the improvements in galvanic apparatus which we are now to deſcribe.

13 Galvanic trough.

By the invention of the trough, for which we are indebted to the ingenuity of Mr Cruikſhank of Woolwich, the progreſs of galvaniſm became rapid and brilliant; for by this means philoſophers were enabled not only to give a longer duration to their experiments, but to command a degree of energy in the galvanic fluid, which, before the diſcovery of this apparatus, was not even ſuſpected. This apparatus, we believe, is now almoſt univerſally employed for galvanic experiments. We ſhall therefore give a more detailed account of the method of conſtructing and uſing it.

Troughs with plates of various ſizes have been conſtructed, from 2 to 6, 8, and even 14 inches ſquare; but as an example, we ſhall ſuppoſe the following trough to be conſtructed with plates of about four inches ſquare. A wooden trough AB, fig. 13. is to be made of baked mahogany; the length may be about 30 inches, and, as we ſhall ſuppoſe the number of pairs of plates to be 50, an equal number of grooves is to be cut on the ſides and bottom of the inſide of the trough. Theſe grooves are to be cut at equal diſtances from each other, and the width of each groove is to be ſuch, as to correſpond nearly to the thickneſs of each pair of plates, ſo that the latter may ſlip eaſily into the grooves.

Fig. 13.

14 Caſting of the zinc plates.

The plates are like thoſe which have been already deſcribed in the conſtruction of the pile made of zinc and copper. No difficulty has ever occurred in procuring plates of copper for this purpoſe; becauſe all that is neceſſary is to cut them out of ſheets of copper of the requiſite thickneſs to any ſize that is wanted. But the caſe has been very different with regard to plates of zinc, eſpecially where large plates were required. Attempts have been made to caſt them in moulds of ſand, ſuch as are uſed for caſting different utenſils of other metals; but theſe attempts, it would appear, have been generally unſucceſsful. The method which it is ſaid has ſucceeded beſt in forming plates of any conſiderable ſize is the following. The zinc of which the plates are to be compoſed is to be melted in a narrow-mouthed veſſel, ſo that a ſmall ſurface of fuſed metal may be expoſed. The reaſon of this is, that the metal when it reaches a certain temperature is very rapidly oxidated in conſequence of the ſtrong affinity between this metal and oxygen. The metal in this ſtate is converted into a fine flocculent ſubſtance, known by the name of flowers of zinc. This change therefore, as it is attended with a loſs of the metal, is to be as much as poſſible avoided. A mould of ſtone of the dimenſions of the propoſed plates (in this caſe four inches), and about one-eighth of an inch in thickneſs, is to be prepared; but one formed of braſs is found to anſwer the purpoſe ſtill better. When the metal is in perfect fuſion, the plates ſhould be caſt as quickly as poſſible, becauſe, as the metal cools rapidly, cavities and imperfections would appear on the ſurface from its flowing unequally.

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The plates of zinc being prepared, plates of copper which need not exceed one-tenth of the thickneſs of the zinc plates are to be cut out of a ſheet of copper to the requiſite dimenſions, viz. correſponding to the ſize of the zinc plates. The copper plates muſt be reduced by hammering to a ſmooth and plane ſurface that they may apply exactly to the ſurface of the zinc plates, and be in contact in as many points as poſſible.

15 Soldering the plates.

The plates being thus prepared are to be ſoldered together; but it muſt be obſerved that it is not to be through the whole extent of the plate. It is found quite ſufficient to ſolder them about one-fourth of an inch from the edges. The ſolder employed for this purpoſe is ſoft ſolder; and great precaution muſt be obſerved that the union at the edges be ſo cloſe as to prevent any of the liquid with which the cells in the trough are to be filled from entering between the plates; for otherwiſe the power of its action would be greatly interrupted or perhaps entirely deſtroyed.

The operation of ſoldering was performed with conſiderable difficulty by many workmen; at leaſt, it was found that in many caſes the plates were either not in contact when the dimenſions were large, or the joints were not perfectly ſecure. We are not certain in what way this operation is generally performed, but we know that this difficulty has been obviated by the following contrivance. The inſide angles on the edges of the plates, that is, on the ſides of the plates which are to be united together, are filed away, ſo that, when the plates are brought into cloſe contact, a triangular groove all round the edge of the pair of plates remains. This groove is filled with ſolder, and the operation is conducted in the uſual way. Plates ſoldered according to this contrivance have been found to anſwer the purpoſe extremely well. But this inconvenience is now rendered leſs embarraſſing ſince the diſcovery of rendering zinc malleable and flexible was made, for plates of zinc of this deſcription are of a much more equal thickneſs, are thinner and ſmoother, ſo that the copper can be brought into a cloſer contact. The plates which have been prepared of malleable zinc have the copper folded over the edge of the zinc plates, and in this way they are ſecured without difficulty, by ſoldering.

In whatever way the pairs of plates are to be ſecured, ſo that they may remain in cloſe contact, they are afterwards

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wards to be fixed in the grooves of the box prepared for their reception; and here it is to be obſerved that each individual pair of plates is to be completely inſulated. This is done by means of a particular kind of cement, the uſe of which is not only to retain the pairs of plates in their places, and to render their inſulation complete, but alſo to defend the wood of the box againſt the action of the fluid which is employed to fill the cells of the trough.

16 Cement for ſecuring the plates.

The cement which is employed for this purpoſe is compoſed of roſin, bees-wax, and fine brick duſt, or powdered red ochre. Different proportions of theſe ſubſtances, it would appear, have been recommended in the conſtruction of galvanic troughs. According to ſome, five parts of roſin, four of bees-wax, and two of powdered red ochre, are found to anſwer this purpoſe extremely well. The roſin and bees-wax are melted together, that they may be completely incorporated, and the red ochre is afterwards added. According to others, four ounces of bees-wax, eight ounces of roſin, and about an ounce of fine brick duſt, melted together in the ſame way, are alſo found to anſwer the ſame purpoſe equally well. With this cement the pairs of plates are ſecured in the grooves, and the intervening ſpaces on the inſide of the bottom and ſides of the trough are alſo covered with it, to defend the wood from the action of the fluid. It is ſcarcely neceſſary to obſerve, that the plates are to be arranged in the ſame way throughout the trough as the firſt pair; that is, if the copper ſide of the firſt pair of plates be towards the end of the trough at B, all the other pairs are to be ſo arranged as to have their copper ſides towards the ſame point B, and the zinc ſides towards the other end of the trough A. The plates being arranged in this way, the end of the trough B is called the copper end of the trough or battery, and the end A is called the zinc end.

Superior advantages are derived from arranging the plates in this way, to that of conſtructing them in the method deſcribed for the pile; for in this way the fluid can be applied more equally and with greater facility; the apparatus is more convenient for performing experiments; its action continues for a conſiderably longer time, and there is little or no trouble in cleaning the plates after the operation. It is otherwiſe with the pile, for, after it has been once uſed, the ſurface of the zinc plates is ſo much oxidated, that before they can be employed again, they muſt be ſcoured or filled, which, it is obvious, muſt be a troubleſome and tedious proceſs; but in the trough the oxidated ſurface of the plates is cleaned in every ſucceſſive operation, the fluid which is employed diſſolving the oxide which has collected on the ſurface of the zinc plates.

17 Fluid to fill the trough.

In treating of the conſtruction and action of the pile, we have already obſerved that different ſaline ſolutions were employed, to moiſten the pieces of cloth or paſteboard interpoſed between the pairs of plates. Theſe ſolutions were muriate of ſoda or common ſalt, muriate of ammonia or ſal ammoniac, and ſometimes ſulphate of potaſh. Similar ſolutions will anſwer the purpoſe of filling the cells of the trough, but theſe are found to be weaker than ſolutions of the acids; and, beſides, as they are apt to cryſtallize on the plates, it becomes extremely troubleſome to clean the trough. Acid ſolutions, therefore, which are more powerful, have been properly preferred; and the acid which ſeems to anſwer beſt, on different accounts, is the nitric; the proportion to be employed, it is obvious, muſt vary according to the ſtrength of the acid. Of the common acid of the ſhops, one part with 16 of water will form a pretty active mixture; but when the acid is ſtronger, it may be neceſſary to add 20 parts of water. But this mixture is attended with the inconvenience of the evolution of nitrous gas, which, it is well known, is extremely diſagreeable, and is injurious to reſpiration; and, on account of the high price of nitric acid, when a large quantity of this mixture is required, it becomes very expenſive. Sulphuric acid mixed with water has alſo been employed for the ſame purpoſe, and it is found to anſwer very well. The uſe of this acid, however, is liable to many ſerious objections. Its action is too rapid; and, by its operation on the zinc, hydrogen gas is diſengaged in ſuch quantity as to be inconvenient to the operator. So much heat is evolved during its action, that the cement which is uſed for ſecuring the plates in the trough, is apt to be rendered ſoft and looſened. Muriatic acid alſo has been employed, and this is recommended by ſome as in different reſpects the moſt convenient. One part of muriatic acid and 16 of water form a mixture which anſwers the purpoſe extremely well. The action of this mixture is ſlow and uniform, and the quantity of hydrogen gas which is evolved is ſo ſmall as to produce little inconvenience. The uſe of this acid is attended with another advantage, that the plates are kept uniformly clean.

Whatever mixture has been employed, unleſs the operation has been continued for a very long time, when it is emptied from the trough, it may be bottled up, and reſerved for future uſe; and if the moſt powerful action of the trough is not required, the ſame mixture may be employed ſeveral times. Here it may be worth while to notice, that the precaution of emptying the trough ſhould be invariably obſerved, as ſoon as the experiments for which it was filled and prepared are finiſhed; by this management there will be a conſiderable ſaving, both of the fluid and of the ſurface of the plates, which undergo oxidation. In filling the trough with the fluid, it ſhould be obſerved that it does not riſe higher than about $\frac{1}{4}$ of an inch from the upper edge of the plates; and after the filling of the trough is completed, the upper edges of the plates, as well as the edges of the trough, ſhould be carefully wiped dry, that there may be no communication between the fluid in the cells, but through the metallic ſubſtances.

A trough compoſed of 50 plates of three inches ſquare, will be found ſuitable for a great variety of uſeful and entertaining experiments; but when it is found neceſſary to produce a more powerful action of the galvanic fluid, a greater number of pairs of plates, or the ſame number with a larger ſurface, according to the nature of the action required, muſt be employed. We have already obſerved, that ſeveral columns or piles may be ſo conſtructed as to have the full effect of their combined action, in the ſame way as if they formed a ſingle pile. By ſimilar management, different troughs or batteries may be ſo arranged as to combine together the effects of each, as if they conſtituted a ſingle trough or battery. And all that is neceſſary to obſerve is, that to whatever extent the ſeries may be carried, the ſurface of each of

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the plates muſt be oppoſed to the ſurface of a different plate; as, for inſtance, the zinc ſurface of one of the plates muſt be conſtantly oppoſite to the copper ſurface of the next plate in the ſeries. The different troughs thus uniformly arranged, are to be connected together by means of metallic conductors. A ſlip of copper, for inſtance, about half the width of the trough, is inſerted by its oppoſite extremities in the cells of the ends of two of the troughs.

When the plates are of very large ſize, their weight, with that of the quantity of fluid required to fill the cells, renders the trough very unmanageable. It is then neceſſary to fix it in a frame of ſufficient ſtrength, to ſupport its weight by means of axles of braſs or iron, fixed to the outſide of the box. By this contrivance the fluid can be eaſily poured out into a proper veſſel placed under the trough.

We ſhall afterwards ſpeak more particularly of the effects of plates of different extent of ſurface; here, however, it may be neceſſary to obſerve, that in combining together two or more troughs or batteries, to have the full effect of ſuch a number of plates as may be employed, in proportion to the extent of their ſurfaces, the ſurface of the plates in each trough ſhould be the ſame, otherwiſe, if troughs of different extent of ſurfaces be employed, the action of that trough which has the largeſt ſurface is diminiſhed, and reduced to that of the action of the trough whoſe plates have the ſmalleſt extent of ſurface. This circumſtance is neceſſary to be attended to, for, if it be overlooked in the conſtruction or combination of different batteries, the effects will be ſo feeble as to produce diſappointment without the cauſe being known.

In making experiments with the trough, the communication is to be formed between the two extremities, or the circle is to be completed in the ſame way as has been already directed in the management of the pile. For this purpoſe there is a projecting piece of wood fixed to the upper edge of each of the ends of the trough; this is perforated ſo as to admit a piece of wire which paſſes through to the fluid in the two laſt cells at the extremity of the trough. If then the wires are placed in this ſituation, and the moiſtened fingers of one hand touch the wire at one extremity, while the moiſtened fingers of the other hand are brought into contact with the wire at the other extremity of the trough, a ſhock will be felt; and in this way the circle is completed.

The other parts of the apparatus which are neceſſary to conduct experiments with a trough of this deſcription, are ſo ſimple as ſcarcely to require any particular deſcription. All that is wanted for deflagrating metals is to have a bent wire fixed at one extremity of the trough, and to have a poliſhed plate of copper or zinc communicating with the other extremity of the trough by means of a flexible wire. The metal to be deflagrated is placed upon the bent wire, and the metallic plate is brought into contact with it.

18 Apparatus for decompoſing water.

The apparatus for the decompoſition of water is the following. A glaſs tube, G, H, fig. 11. about three inches long, and $\frac{1}{2}$ inch in diameter, is furniſhed with a tight cork at the upper end G, through which cork the wire *i* communicating with the upper part of the pile, paſſes. It may be alſo furniſhed with a cork at the other extremity H, but this muſt have grooves cut on its ſides, to allow the water to eſcape from the tube. The wire K communicating with the bottom of the pile, paſſes through this cork; or without the cork at this extremity, if the tube is retained in its perpendicular poſition by any other contrivance, the wire K may be paſſed within the tube. When this operation is to commence, the tube is to be filled with water, the cork at the upper extremity G being made air-tight, and then it is to be inverted, and the extremity H to be placed in a ſmall cup or baſon of water; after which the wire K being introduced, the circle is completed between the wires through the medium of the water in the tube, the decompoſition of which will go on as long as the communication and the action of the pile are continued. This proceſs will be obſerved by bubbles of air eſcaping from one of the wires, and riſing to the top of the tube; or if the wires are of gold or of platina, bubbles of air will be ſeen paſſing from the extremity of both wires, and this air collecting at the top of the tube, forces out a quantity of water equal to the ſpace which it occupies. The ſame experiment may be made by means of a ſtill ſimpler apparatus. If the wires communicating with the extremities of the pile are introduced into a ſmall glaſs phial filled with water, and inverted in a baſon of water, the ſame proceſs of decompoſition will go on.

But an apparatus which is rather more complicated, but at the ſame time ſufficiently convenient, is uſually employed for this purpoſe. A ſmall braſs cup E, fig. 13. is ſupported by the wire F, which is fixed in the hole of the projecting piece of wood D, at one end of the trough; from the centre of the cup there ariſes a pair of braſs pincers, which hold a piece of wire of gold or platina G. Over the pincers is placed a glaſs tube HI, which has at the upper extremity, I, a braſs cap, to the inſide of which is fixed another piece of wire of gold or platina. The two wires ſhould be at a little diſtance from each other, as they appear in the figure. The tube is then filled with water, and is inverted over the pincers in the braſs cup, which is alſo filled with water; and thus, by means of the water in the tube, a communication is formed between the two wires. A wire proceeding from the other extremity of the trough C, is connected with the top of the tube I, and, as ſoon as this communication is formed, the proceſs of the decompoſition of the water in the tube commences; for the galvanic circle, or the communication between the extremities of the trough or battery is completed. The gaſes, as they are diſengaged from the wires in the tube, riſe to the top, and the water which occupied the ſpace now filled with air, is forced out into the cup. This proceſs goes on as long as the communication continues, or till the ſurface of the water is lower than the extremity of the upper wire, when the communication is interrupted, and then the operation ceaſes.

With theſe obſervations we conclude what was intended to be ſaid concerning the conſtruction of galvanic apparatus. We ſhall notice what may be farther neceſſary to be explained, in the courſe of the detail which is to be given of the experiments in galvaniſm, or of the influence of the galvanic fluid on animals, as well as its chemical effects. We, therefore, now proceed, in the following chapter, to the conſideration of ſome of theſe phenomena.

CHAP.

Effects of Galvanism on Animals.

Chap. II. *Of the Effects of the Galvanic Fluid on Animals.*

19 Animal electricity.

It has been already obſerved, that the firſt effects of galvaniſm were exhibited on animals; and indeed it was ſuppoſed that theſe effects could only be exhibited by means of animals; and hence, from the coincidence which was obſerved with the properties of electricity already known, it was denominated *animal electricity*.

The firſt experiments which were made in inveſtigating the nature and properties of the galvanic fluid, were chiefly performed on cold-blooded animals. It was indeed from obſerving its effects on them, as we ſhall find afterwards in tracing its hiſtory, that the diſcovery was firſt made. This diſcovery was made on the frog, and ſince that time the frog has been oftener the ſubject of galvanic experiments than any other animal. From being found in great numbers, from being conveniently got, as well as from the irritability of the muſcular fibre, as it is denominated by phyſiologiſts, continuing for a long time, it has perhaps become the devoted victim of theſe inveſtigations.

We have already mentioned a ſimple experiment with a prepared frog, in which it forms the communication between two diſſimilar metals. When the frog, as in fig. 1. is prepared, that is, ſkinned, and the lower extremities ſeparated from the ſpine, and ſuſpended on the zinc wire AB, if the extremities of the frog be touched with a different metallic ſubſtance, ſuch as gold or ſilver, while this metallic ſubſtance is in contact with the zinc wire at the point D, the limbs of the frog are thrown into convulſions, and this takes place as often as the communication is formed.

20 Experiments of Valli and the French philoſophers.

Soon after the diſcovery of Galvani, and after the reſult of his experiments and opinions on the ſubject of this diſcovery was announced to the world, the attention of philoſophers became much occupied in repeating and extending theſe experiments. Among others, Valli, an Italian phyſician, inſtituted a ſeries of experiments, an account of which was communicated to the French philoſophers, who ſoon after repeated them. As theſe experiments afford us not only a pretty full view of the effects of the galvanic fluid on animals, but alſo the ſtate of galvaniſm at the time, we ſhall here detail them.

Experiment 1.—When two metallic coatings or ſlips of metal, the one of lead, and the other of ſilver, were placed on a frog, faſtened to a table, the coating of lead being placed on the belly of the animal, and that of ſilver on the pelvis, and a communication being formed by means of a ſlip or wire of copper, ſtrong convulſive motions were produced in the animal.

Exper. 2.—The coating or ſlip of lead which was employed in the preceding experiment, was removed, and the abdomen was left bare. The copper wire was then applied to the abdomen the ſame way as before, while its other extremity was in contact with the coating of ſilver on the pelvis; convulſive motions were ſtill produced, but they were leſs ſenſible than in the former experiment, and ſometimes did not ſucceed at all.

Exper. 3.—When two coatings of the ſame metal were employed, as, for inſtance, ſilver or gold, the effects produced by means of copper forming the communication, were found to be much fuller; and when the coatings were of ſimilar metals, ſuch as copper, lead, or tin, and the metal forming the communication was the ſame, no effect whatever was produced.

Exper. 4.—By placing the coating on the abdomen in a horizontal direction, ſo that the points of contact became leſs numerous, the effects were found to be proportionally diminiſhed; but when the coating was brought into full contact with the ſurface of the abdomen, it was obſerved that they became equally powerful as before.

Exper. 5.—A frog was ſkinned and cut tranſverſely through the middle; the nerves of the thighs were laid bare, joined together, and placed on a ſlip of gold, while the thighs themſelves were in contact with a piece of ſilver. When the metallic conductor of copper was applied, ſlight contractions were produced. It was found alſo that contractions took place when both the coatings were of ſilver; but when coatings of tin, copper, or lead, were ſubſtituted for the ſilver coating which ſurrounded the nerves, powerful contractions took place. The gradation obſerved in the action of the metals, is the following. Lead produced the ſtrongeſt contractions, next the tin, and laſtly the copper; but in proportion as the vitality of the animal diminiſhed, the metals were found alſo to loſe their power of producing motion. The metals which retained this property longeſt were lead, tin, and zinc.

Exper. 6.—When plumbers lead was employed on each ſide as a coating, and when the metal forming the communication was the ſame, no effect was produced; but when lead of different qualities, as, for inſtance, lead of the aſſayer and plumbers lead, was uſed, and the metal forming the communication being either the one or the other, very ſingular effects took place.

While it was found that theſe two kinds of lead, by changing the different metals, were no longer ſuſceptible of producing any effect in one of the coatings, ſilver, gold, biſmuth, antimony, or zinc, ſubſtituted for the lead, produced very powerful contractions; and, what ſeemed ſtill more ſingular, when the pieces of lead in the firſt part of this experiment were re-applied, ſlight convulſions took place.

Exper. 7.—After a ſhort interruption of the experiments on the ſame animal, it appeared that it became ſuſceptible of pretty ſtrong convulſive motions, when the ſame experiments were repeated.

Exper. 8.—When the galvanic power ſeemed to be nearly exhauſted in the frog, it was found that the different metals, when they produced, by their contact, new convulſions, did not, when this effect could be no longer produced, leave to the animal the power of exhibiting anew any contractions with coatings of the different kinds of lead, as in experiment 6.

Exper. 9.—The following is the gradation of the diminution of effect, till it entirely ceaſed, when the plumbers lead always formed one of the coatings. With the aſſayers lead forming the other coating, the action became feeble, and it at laſt ceaſed. The next in order was tin, the next antimony, and ſo on in the order in which they are named as follows: zinc, copper, gold, ſilver. Iron, it was obſerved, had loſt its power of producing any effect before the antimony; but whether it was deprived of this property before lead and tin, was not aſcertained.

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Exper. 10.—Zinc, on loſing the property of exciting convulſions in a frog, on which experiments had been made for an hour, was not found ſuſceptible of any farther action, when the communication was formed by means of lead; but it was obſerved as a very ſingular circumſtance, that contractions were ſtill produced by this metal the moment that the perſon engaged in the experiment removed the conductor, and interrupted the circle. This experiment was frequently repeated.

Exper. 11.—The upper part of a frog which was ſkinned, and divided tranſverſely, had the crural nerves, as in the former experiments, armed with a piece of lead, and placed in a glaſs filled with water, while the lower part was placed in another glaſs, alſo filled with water. Strong contractions were produced when the communication was formed by means of different perſons holding each other by the hand, while two of them touched the water in the glaſſes. One of them held in his hand a piece of metal, which was brought into contact with the coating of lead.

Exper. 12.—When any one individual of the perſons who thus formed the chain of communication between the two glaſſes withdrew himſelf, ſo that the communication was interrupted, no effect was perceptible.

Exper. 13.—When the frog was arranged in the ſame way as in experiment 11. having its parts placed in two glaſſes, no motion was excited when a communication was eſtabliſhed with two fingers; nor was any motion produced, when a perſon with one hand armed with a piece of metal, touched the body of the frog, while he brought a finger of the other hand in contact with the metallic coating of the crural nerves. But by placing one finger on the inferior part of the frog, he touched with a piece of metal the coatings of the nerves, powerful contractions were produced.

Exper. 14.—When the animal was touched with a metallic ſubſtance in an inſulated ſtate, no perceptible effect was obſerved; but when the metals ceaſed to be inſulated, very conſiderable motions were invariably produced.

Exper. 15.—The fore leg of a rabbit was ſeparated from the body; the brachial nerves were laid bare, and armed with a bit of ſheet lead. The communication between the lead on the nerve and one of the contiguous muſcles was made with a piece of ſilver, and ſtrong convulſive contractions took place in the limb; but when this experiment was varied, by ſubſtituting for the metallic conductors, plumbers and aſſayers lead, no farther motion was produced. When one of the coatings employed was lead, and the other iron, no perceptible motion was obſerved. But when lead as one of the coatings, was employed with ſilver, gold, copper, zinc, or antimony, as the other coating, the motions and contractions of the limb were renewed. The motions were very ſlight, which were produced by means of a coating of biſmuth, along with a coating of lead.

Exper. 16.—This experiment was inſtituted to aſcertain the ſtate of the electricity in the animal which was the ſubject of it. With this view, the animal was placed in a veſſel containing one or two of Coulomb's electrometers, and it was then ſucceſſively electrified, both poſitively and negatively; and in both of theſe caſes the balls of the electrometer were ſo much influenced by the animal, as to ſhew, not only that its electricity was in a ſtate of perfect reſt, both before and during the time of the experiment, but alſo to exhibit in the ſyſtem of the body on which the experiment was made, in a very diſtinct and ſtriking manner, phenomena quite analogous to thoſe of the Leyden phial.

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Exper. 17.—The left crural nerve of a living frog being tied with a ligature ſo ſtrongly, that the animal was deprived of the power of motion in that part of the limb below the point where the ligature was fixed; but when the nerve was armed with a metallic coating, in the way deſcribed in the former experiments, and a communication was formed between the part of the nerve above the ligature and the muſcle, the motion and contraction of the limb were excited.

Exper. 18.—The ligature was afterwards placed on the left crural nerve, and brought in contact with the muſcle. It was alſo fixed in ſuch a way on the right crural nerve, ſo that part of it projected: the left part of the animal was then quite paralytic, and without motion, and the convulſive contractions which were produced when the communication was formed, were entirely limited to the right ſide; but when the ſame left crural nerve was more completely laid bare, and ſeparated from the muſcular ſubſtance which ſurrounded it, its conducting power was reſtored, and the communication being eſtabliſhed, the convulſive motions became pretty ſtrong. When, however, the ligature was again brought into contact with the muſcle, the limb was again deprived of its power of motion.

Exper. 19.—One of the crural nerves of a frog being laid bare, was armed with a piece of ſheet lead; and a communication having been formed between this nerve and the other crural nerve, which was unarmed, very ſtrong convulſive motions were produced.

Exper. 20.—When one of the crural nerves was armed with two pieces of lead at different places in its courſe, and a communication formed between the two parts by a metallic conductor, violent agitations followed. It was obſerved, too, that the ſame effects took place, when the whole of the nerve was laid bare, and completely ſeparated from the ſurrounding muſcle.

Exper. 21.—A ſimilar experiment was made on a hot-blooded living animal. The animal ſelected for this purpoſe was a guinea pig; but when the communication was eſtabliſhed in the uſual way, no effect followed, from which any thing preciſe or ſatisfactory could be deduced.

21 Length of time that motion can be produced on frogs.

With a view to diſcover during what length of time frogs, which were made the ſubjects of theſe experiments, could reſiſt their effects, and retain the power of having motion excited in them, Valli made a number of experiments. At 10 o'clock at night he prepared two frogs, which on the following morning at ſeven o'clock he found had become extremely feeble, but not entirely deprived of the power of motion. Slight convulſions were excited in both by means of the galvanic apparatus; but an hour having elapſed they ceaſed to afford any farther ſymptoms of vitality. No effort that could be made, ſucceeded in producing motion. In other caſes he prepared frogs, which by the following morning were found to be quite dry, and then no ſymptoms of motion could be exhibited. He ſeparated ſeveral of the muſcles from the body of a frog, and after having torn them, he found it impoſſible to

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to excite the irritability by any mechanical ſtimulus whatever; but, after previous preparation, and by means of a metallic conductor, motion was produced.

22 Effects of narcotics on animals ſubjected to galvaniſm.

The ſame naturaliſt made a variety of experiments, to aſcertain the effects of galvaniſm on animals which were deſtroyed with opium, and other narcotic ſubſtances; but the reſults of his experiments on animals to which opium had been exhibited internally, as well as applied externally, were found to be very different from each other. Four frogs were deſtroyed by means of powdered tobacco, were rendered completely inſenſible to any mechanical ſtimulus, and ſeemed to be in a ſtate of total ſtupefaction; but by the application of the galvanic apparatus, ſymptoms of vitality appeared, and ſlight motions were produced. A number of lizards being poiſoned with tobacco, exhibited, at the time of their death, convulſive motions; but they ſtill continued to afford ſymptoms of vitality and motion on the application of galvaniſm.

23 Of hydrogen gas, &c.

Animals were deſtroyed in a variety of ways, with a view of aſcertaining what were the effects of galvaniſm, after the principle of life ſeemed to be extinguiſhed. A ſmall bird, which was for ſome time immerſed in hydrogen gas, or inflammable air, ſhewed no ſymptoms of vitality or motion; but, on the application of galvaniſm, convulſive contractions of its limbs were produced. Two kittens were killed in azotic gas, and the fore legs were ſeparated and prepared in the uſual way. The ſame effects were produced as in the experiment with the bird.

Some animals were deſtroyed with the extract of hemlock; but it did not appear that the effects on the application of the galvanic apparatus were at all diminiſhed by means of this poiſon. In frogs which were expoſed to the exhalation of corrupted animal matters, perceptible motions were obſerved by means of galvaniſm; but theſe were very feeble.

Moſcati deprived ſeveral frogs of life, by placing them in the vacuum of an air pump; and when theſe were ſubjected to experiment with the galvanic apparatus, ſlight motions were produced; but it was obſerved that theſe, although they followed each other in rapid ſucceſſion, were excited with ſome difficulty. Here it was found that the blood was extravaſated in the cellular membrane of the muſcles, by which the fleſh was tinged with a deep red colour. To this circumſtance was aſcribed the feeble effects produced in the above experiment, as it was ſuppoſed that the blood carried off part of the galvanic fluid, and thus prevented its action on the muſcular fibres, through the medium of the nerves. This opinion was ſupported by another experiment, which was made on prepared frogs, in which there was no extravaſation of blood; and in this caſe the galvanic effects did not ſeem to be in any degree diminiſhed.

Before proceeding farther with an account of the experiments of the particular effects of galvaniſm on animals, we ſhall here relate two of a more general nature, the one with regard to the effects produced by the peculiar application of the metallic conductor, and the other with reſpect to the velocity of the galvanic fluid being increaſed, without increaſing its intenſity.

24 Difference of effect in applying the conductor.

A difference, which appeared to be a very ſingular fact, was obſerved in the mode of applying the metallic conductor, to excite motion in animals by means of galvaniſm. It was found, that the motions produced in the animal by this means were generally more powerful, when the conductor was applied, firſt to the muſcles, and then to the coating, than if the reverſe had taken place; that is, by applying firſt to the coating, and afterwards to the muſcles; and indeed when the galvanic power began to be nearly exhauſted, no motion whatever could be excited when the application was made, firſt to the coating and then to the muſcles, while at the ſame time, by the contrary mode of application, motion could be eaſily produced.

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25 Velocity of the galvanic fluid increaſed without increaſe of intenſity.

The other fact alluded to is, that the velocity of the galvanic fluid may be increaſed without increaſing the degree of its intenſity. This was proved by M. Valli in the following experiment. By means of a chain, which was in contact with the nerves of a prepared frog, he completed the galvanic circle. The animal at firſt exhibited convulſive contractions, but afterwards remained for ſome time without motion. When the conductor was removed to a very ſmall diſtance, motion was again excited in the animal; ſoon after, however, this ceaſed. But when an inſulated conductor was brought to the muſcles of the frog, the motions were immediately renewed; and when they again ceaſed, a communication being formed between the operator himſelf and the conductor, the contractions were again excited. The concluſion which he deduced from the above experiment was, that the galvanic influence is conſtantly the ſame, however various the modes of its application. The ſame reſult, however, he obſerves, would not be obtained, if the experiment were made on an animal in which the principle of life was in full vigour.

From a number of experiments which were made by the ſame phyſiologiſt, it appeared that certain intervals were neceſſary, in order to obtain the ſame intenſity of action in animals ſubjected to the influence of the galvanic fluid. Frogs, mice, rats, and tortoiſes, were the ſubjects of theſe experiments; they were deſtroyed by means of different poiſons, or by reſpiring ſome of the noxious gaſes. In applying the galvanic apparatus to theſe animals, an interval of ſeveral minutes was required, when the motions excited became feeble, or had nearly ceaſed; and then, after this interval had elapſed, the ſame effects, and almoſt equally powerful, as before, were produced.

26 Conducting power of blood veſſels inveſtigated.

With regard to the conducting power of the blood-veſſels, two queſtions were propoſed to Valli, by Vicq D'Azyr. 1. Whether the blood-veſſels are to be conſidered as conductors of the galvanic fluid. And, 2. Whether, by coating the blood-veſſels inſtead of the nerves, any motion through their medium could be excited? In the ſolution of theſe queſtions Valli obſerved, that the blood-veſſels are undoubtedly to be conſidered as conductors of the galvanic fluid; but in whatever way this is effected, it ſeems to be through the nerves alone, in conſequence of the way in which they are diſpoſed, that muſcular motion can be excited. The arteries and veins, he farther obſerves, are to be conſidered as leſs powerful conductors than the nerves; for no motion is obtained, if the veſſels, without having any communication with the nerves be diſtributed directly to the muſcles. The tendons alſo, when the ſame communication is eſtabliſhed, are alſo conductors as well as the bones, if they have not been deprived of the

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the periosteum. The membranes also possess this conducting power; but exhibit no motions when the communication with the nerves is interrupted.

It had been observed, that the nerves, when dry, exhibited, by means of friction, some symptoms of electricity. With a view to ascertain whether, in this dry state, the nerves were conductors of the galvanic fluid, and whether motions could be excited through this medium, Valli made several experiments; but in all these he was unsuccessful, for no motion was produced. In a series of experiments which were made on fowls, he found that ligatures applied to the nerves, did not prevent the contractions of the muscles, provided these ligatures were not applied to the nerves in immediate contact with the muscles.

27 Effects on drowned animals, &c.

In order to ascertain what would be the effects of the galvanic fluid on animals which were drowned or suffocated, Valli made a number of experiments. Several pullets were drowned, and kept so long under water, that no symptoms of life appeared. By the application of the galvanic apparatus, muscular contractions were produced in some, while others, by the same application, exhibited no motion whatever. The same experiment was repeated on six pullets, which were also drowned; and on the application of the apparatus, strong convulsive motions were produced. These continued for nearly the space of an hour. In others which were also drowned, the brain and wings were laid bare; and after this previous preparation, when the galvanic apparatus was applied, strong muscular contractions were excited: none of the animals, however, as was expected, were restored to life. Similar experiments, followed by the same result, were made on rabbits.

Several pullets were exposed to the action of different gases, as hydrogen, nitrous, and azotic gases, and did not afterwards, by any mechanical stimulus whatever that could be applied, exhibit symptoms of life. The galvanic apparatus being applied, very feeble contractions were produced; and these succeeded each other after long intervals. Similar experiments were made with the same view, on frogs, and it appeared that these animals could resist the effects of those gases better than the others. Nitrous gas, he found, was more injurious than hydrogen gas. In some of the frogs on which the experiments were made, the application of the galvanic apparatus produced violent agitations; but having repeated three or four shocks, no farther motion could be excited, not even after some interval had elapsed.

To ascertain what were the effects of different kinds of air on animals subjected to the galvanic apparatus, he separated the hinder extremities of a frog, exposed the one to the action of nitrous gas, and the other to that of atmospherical air. After being subjected for a short time to the action of these airs, the galvanic apparatus was applied. Contractions were produced in both; but those which were induced in the limb exposed to the nitrous air, were feebler than the other; and when the action of the nitrous air was continued beyond a very limited time, no motion whatever could be excited. The same experiment was made on limbs exposed to the action of hydrogen gas; and it appeared that its effects in destroying the irritability of the muscular fibre, or in diminishing its susceptibility of being acted upon by galvanism, were less powerful than the nitrous gas. Azotic gas was also found to produce effects on frogs somewhat similar. The heart was indeed observed to palpitate after the death of the animal; but, in general, the contractions which were induced by galvanism were extremely feeble.

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It would lead us too much into detail to mention all the experiments which were made by this naturalist. We shall therefore only add a short account of the general results.

28 Results of Valli's experiments.

1. In frogs newly killed, he found, that a single metallic conductor was sufficient to excite convulsive contractions; and that in producing these motions, it was not found essentially necessary to apply a coating either to the muscle or nerve. Scissars, in which the steel appeared to be of a bad quality, might be successfully employed as a conductor; but gold, silver, copper, lead, and tin, in general, produced no effect.

2. The galvanic fluid was found to pass through glass and sealing wax; but it was necessary that these substances should have their temperature considerably increased.

3. Water in which the temperature was pretty high, or when raised to the boiling point, seemed to prevent the effects of galvanism from taking place, or at least diminish them greatly.

4. Water, the temperature of which was very much reduced, seemed also to be deprived of the property of conducting the galvanic fluid.

5. It was found, that when an individual formed part of the chain in cases where the galvanic apparatus was applied to the prepared feet of rabbits, cats, and dogs, the latter were unsusceptible of motion.

6. The diaphragm of a dog was immersed in a vessel of water, and so placed in the vessel, that the phrenic nerve, previously armed, projected from it; and on touching the coating with a piece of gold or silver coin, while one of the fingers of the other hand was put into the water, feeble contractions were excited in the muscle. In some other experiments on the same muscle of horses, it was found that no motion could be induced by means of galvanism, while the same power, with the same intensity, constantly excited contractions in that of dogs.

7. A metallic wire, which was entirely covered with sealing wax, produced no motion in frogs, which began to be exhausted when it was employed as a conductor. This was stated by Valli, as a proof that the galvanic fluid passes along the surface of conductors.

8. A ligature on the nerve, when placed near to the muscle, or in contact with it, interrupted or diminished, the effects of galvanism: it was found also, that a ligature, applied in the same way, prevented the effects of artificial electricity.

9. A ligature was applied, at a small distance from the muscle, to the crural nerve of a frog, and another was prepared in the same way, but without any ligature; these being subjected to experiment, it appeared that galvanism produced a more perceptible action in the latter than in the former.

10. Weak shocks of artificial electricity produce motion in the muscles of that leg only where no ligature has been applied to the nerve; but in the other, muscular contractions can be excited by means of the galvanic apparatus. From this experiment, it was attempted to deduce a method of subjecting the intensity of galvanism

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nism to calculation. If, for example, it is found that the effects of artificial electricity are considered as amounting to five, six, or seven degrees, and this power is insufficient to excite contractions, while they are produced by means of galvanism, it may be said that the latter is five, six, or seven degrees stronger than the former.

11. Valli did not succeed in effecting the muscular contraction of the heart by means of galvanism; nor did he succeed in similar experiments made on the stomach, intestines, or bladder, although he armed or applied metallic coatings to the nerves of all these organs.

12. To produce contractions in the wing of a fowl, the nerves of which were coated and previously steeped in oil, very powerful shocks of artificial electricity were found requisite; but the effects of the galvanic fluid did not, by this process, seem to be at all diminished: it retained its whole energy.

29 Experiments by Fontana,

Fontana, in his experiments and investigations on this subject, found, that he could accelerate the motions of the heart, when these motions were going on; and when the motions had ceased, could bring it to produce contractions. By placing the heart between two pieces of metal, zinc and antimony, so that it shall be in contact with both, and then forming a communication by means of a metallic conductor between the two metals, its motions are excited, even after it is separated from the body and cut in pieces. According to the experiments of Marsigli, part of the heart of a fowl, placed on a piece of charcoal, and another portion put on a piece of pasteboard, covered with tinfoil, gave repeated contractions, and was strongly convulsed.

30 By Delamerie,

M. Delametherie made a variety of experiments, at a very early period, on this subject. The following are some of the general results of these experiments.

1. He found that the effects of galvanism in a prepared frog were feeble.

2. That it possesses the greatest intensity at the time when the animal has been just deprived of life; from this he infers, that the intensity of the effect must be greater in the living animal; from which he thinks it follows, that it is only by means of good conductors that the galvanic fluid can be conveyed from the nerves to the muscles of a frog; and it is by means of the metals, which may vary in the degree of their conducting power, that this communication is established.

3. Plumbago and charcoal were found to be inferior in their conducting power to metallic substances; but by their means the galvanic fluid could be conveyed from the nerves to the muscles of a frog.

4. He did not find from his experiments that this effect could be produced by forming the communications by means of animal substances; for when a person touched at the same time the nerves and muscles of a frog which had been laid bare, the same effect did not follow.

31 Volta.

Volta, whose name has been already mentioned as the inventor and improver of the apparatus by means of which the galvanic power could be greatly increased, was, at the same time one of the most zealous and the most indefatigable inquirers into its nature and properties. The views which this philosopher entertained with regard to the nature of this fluid, were different from those of Galvani. They are distinguished for their originality, exhibit a train of careful investigation, and have served as an excellent foundation on which the superstructure of galvanism was quickly raised. We shall therefore give a pretty full detail of the experiments and reasonings of this philosopher; and from the importance of his views, which we have stated above, it will not be less acceptable to the reader, if this detail be given, as we propose to do, in his own words. In this, indeed, something of what belongs to the second part of this treatise, will be unavoidably anticipated; but the sacrifice of strict method to perspicuity, will, we are persuaded, be readily admitted as a sufficient apology for this deviation.

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To understand clearly the peculiar views which Volta has embraced in the observations which we have now referred to, it will be necessary to anticipate a little farther, by stating, that, according to Galvani, the fluid which bears his name is a peculiar kind of electricity, which resides in the organs of the animal, and is essentially and inseparably connected with them. But, according to the theory of Volta, the whole phenomena of the galvanic fluid depend entirely on artificial electricity, which is excited into action, or put in motion, when conductors of a different nature are brought into contact; and these, he thinks, are to be considered as the primary exciters. The motion of this fluid is induced in three different ways, that is, by means of three conductors at least, which are of a different nature, being so arranged as to form the communication or circle. In the first way, two metals or conductors of the first class, of a dissimilar nature, are employed. These are brought directly into contact by one of their extremities; but the communication between the other extremities is established by means of moist conductors, or conductors belonging to the second class. This fluid is put in motion another way, by a single metallic conductor of the first class, placed between two moist conductors of a dissimilar nature, between the latter of which a communication is established. In the third way of exciting the action of this fluid, or putting it in motion, a communication is formed among three conductors, each of which is of a different nature. To illustrate the variety of action observed in these conducting substances, the following account of the experiments of this naturalist, with his views and reasonings, was communicated by him in letters to Gren.

"If a tin bason, says he, be filled with soap-suds, lime-water, or a strong ley, which is still better, and if you then lay hold of the bason with both your hands, having first moistened them with pure water, and apply the tip of your tongue to the fluid in the bason, you will immediately be sensible of an acid taste upon your tongue, which is in contact with the alkaline liquor. This taste is very perceptible, and, for the moment, pretty strong; but it is changed afterwards into a different one, less acid, but more saline and pungent, until it at last becomes alkaline and sharp in proportion as the fluid acts more upon the tongue, and as the activity of its peculiar taste and its chemical power, more called forth, produce a greater effect in regard to the sensation of acidity occasioned by the stream of the electric fluid, which, by a continued circulation, passes from the tin to the alkaline liquor, thence to the tongue, then through the person to the water, and thence to the

tin

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tin again. I explain the phenomenon in this manner according to my principles; and indeed it cannot be explained in any other, as every thing tends to confirm my aſſertion, and to prove it in various ways. The contact of different conductors, particularly the metallic, including pyrites and other minerals as well as charcoal, which I call *dry conductors*, or of the firſt claſs, with moiſt conductors, or conductors of the ſecond claſs, agitates or diſturbs the electric fluid, or gives it a certain impulſe. Do not aſk in what manner; it is enough that it is a principle, and a general principle. This impulſe, whether produced by attraction or any other force, is different or unlike, both in regard to the different metals and to the different moiſt conductors, ſo that the direction, or at leaſt the power with which the electric fluid is impelled or excited, is different when the conductor A is applied to the conductor B, and to another, C. In a perfect circle of conductors, where either one of the ſecond claſs is placed between two different from each other of the firſt claſs, or, contrariwiſe, one of the firſt claſs is placed between two of the ſecond claſs different from each other, an electric ſtream is occaſioned by the predominating force either to the right or to the left; a circulation of this fluid, which ceaſes only when the circle is broken, and which is renewed when the circle is again rendered complete. This method of connecting the different conductors will be more readily comprehended by turning to the figures, where the capital letters denote the different conductors or exciters (*moteurs*) of the firſt claſs, and the ſmall letters thoſe of the ſecond claſs. Fig. 3. and 4. expreſs the two caſes above mentioned.

"I conſider it as almoſt ſuperfluous to obſerve, that when the circle conſiſts merely of two kinds of conductors, however different or however numerous the pieces may be of which each conſiſts, two equal powers are oppoſed to each other; that is, the electric fluid is impelled with equal force in two different directions, and conſequently no ſtream can be formed from right to left, or, contrariwiſe, capable of exciting convulſive movements.

"There are other caſes, however, and other modes of combination, where the powers are equally in equilibrium, and where no current of the electric fluid can take place; or, at leaſt, none of ſuch a force as to make an impreſſion on the tendereſt nerves, or to excite any convulſive movement in the beſt prepared frog that may be placed in the circle, notwithſtanding the intervention of two or more different kinds of metals. This is the caſe when each of theſe metals is placed between two moiſt conductors, or of the ſecond claſs, and which are very nearly of the ſame kind; or when, in a circle of three pieces, two of them of the ſame metal, and one of a different metal, are ſo connected, that the latter is immediately between the other two.

"When one of the ends of a piece of metal, which is a conductor of the firſt claſs, is immediately applied to another of the ſame claſs, but, inſtead of immediately touching with the other end, the other piece touches an intermediate conductor of the ſecond claſs, either great or ſmall, either a drop of water, a piece of raw or boiled fleſh, or of ſponge not moiſt, paſte of meal, jelly, ſoap, cheeſe, or the white of an egg boiled to hardneſs; in this new combination, where a conductor of the ſecond claſs is between two of the firſt claſs, the powers are no longer oppoſed to each other; and this is ſufficient to determine an electric ſtream. When, therefore, a prepared frog is placed as the conductor of the ſecond claſs, it will always be violently agitated as often as this circle is made complete.

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"It may be readily perceived that the two laſt experiments coincide with thoſe announced by M. Humboldt, where a drop of water, a ſmall bit of freſh meat, or a very thin ſtratum of any fluid, performs the whole wonder. When another drop of water, or any other aqueous conductor, is applied between the other end of the firſt conductor and the other correſponding piece, each piece of metal is inſulated, as I ſhall expreſs it, between two aqueous conductors; but then the powers from right to left, and from left to right, are again completely oppoſed to each other; conſequently the electric ſtream is impeded, and the frog remains without any movement. It is, therefore, abſolutely neceſſary that two different metals or conductors of the firſt claſs, ſhould be in immediate contact with each other, on the one ſide, while with their oppoſite ends they touch conductors of the ſecond claſs.

"We might conſider this mutual contact of two different metals as the immediate cauſe which puts the electric fluid in motion, inſtead of aſcribing that power to the contact of the two metals with the moiſt conductors. Thus, for example, in fig. 3. inſtead of admitting two different actions, at leaſt, in regard to the magnitude of the power, one where B comes in contact with *a*, and another where A comes in contact with *a* alſo, by which an electric current ariſes in the direction from A to B, we might ſuppoſe only one action at the point where B comes in contact with A, which impels the fluid in that direction. In both ſuppoſitions the reſult, as may eaſily be ſeen, is the ſame. But though I have reaſons for adopting the firſt as true rather than the ſecond, yet the latter repreſents the propoſition with more ſimplicity, and it may be convenient to adhere to it in the explanation, as it affords a readier view of it. We may then ſay, that in the caſes above ſtated, no effect will be produced, becauſe here there is no mutual contact of different metals; the effect alſo will be null, when a conductor of the firſt claſs, on two oppoſite ſides, is in contact with two others of the ſame claſs; for the actions therefore are in equilibrium; and, laſtly, that an electric current will be occaſioned by the action which ariſes from the contact of conductors of the firſt claſs, and which is counteracted by no other contact of the like kind.

"Having ſeen the reſult of employing three pieces of metal, or conductors of the firſt claſs, viz. two of one kind and one of a different, when combined ſometimes in one way and ſometimes in another, with conductors of the ſecond claſs, we ſhall now try what will be the reſult, according to my principles, with four pieces of metal, two of which are of one kind, for example, zinc, when connected with moiſt conductors of different kinds.

"I ſhall firſt obſerve, that when they are connected in a circle, the powers which endeavour to put the electric fluid in a ſtreaming movement will be oppoſed to each other, and in perfect equilibrium, and that conſequently no movement can take place in the frog, here ſuppoſed to be the moiſt conductor *a*, or a part of it, however irritable and well prepared it may be;

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be; and if the experiment be made with accuracy and the neceſſary precaution, ſo that the metals, in particular, be very clean and dry at the points of contact, it will perfectly confirm what I have above ſaid; the frog will experience no agitation, no convulſive movement.

"Theſe movements, on the other hand, took place, as might be foreſeen from my principles, as often as I omitted one of the middle pieces, or changed the order.

"The conductors of the ſecond claſs, which, in all the figures, are denoted by ſmall letters, may be cups with water, in which the ends of the pieces of metal denoted by the large letters are immerſed; or ſponges or other bodies which have imbibed aqueous moiſture. They may be either large or ſmall, and may conſiſt of one or more pieces, provided they be in proper contact; they may alſo be perſons, if their ſkin be moiſtened at the places of contact, &c. By the laſt method the experiments will be very beautiful and inceſſant, when the circle conſiſts of three or more perſons (I have formed it frequently of ten, and even more), of two or more frogs properly prepared, and of four pieces of metal, two of ſilver and two of iron, tin, and particularly zinc. The change of effect, when you change the connection, is ſtriking.

Fig. 14. "Let the poſition be as repreſented in fig. 14. where *g* is the prepared frog, which the two perſons *p*, *p*, hold in their hands, one on the one ſide by the feet, and the other on the oppoſite by the rump. Z, Z, are two plates of zinc, which are held alſo by theſe perſons, and A, A two pieces of ſilver, which are held by a third perſon, denoted alſo by *p*. It muſt not be forgotten that the hands ſhould be very moiſt, as the dry ſkin is not a conductor ſufficiently ſtrong. As in this chain the actions of the electric exciters are oppoſed to each other, and in exact equilibrium, as may be readily perceived, no convulſion or agitation in the frog will take place.

"Now, let one of the metallic pieces A, Z, which ſtand between the two perſons, *p*, *p*, or between any other moiſt conductors, be left in combination as it is; and let the poſition of the two other metallic pieces Fig. 15. A, Z, be reverſed, by converting fig. 14. into fig. 15. (ſo that the actions, inſtead of being contrary, will act together to impel the electric fluid to one ſide or to produce the ſame current); or introduce between A and Z another perſon, or any other conductor of the Fig. 16. ſecond claſs, ſo that the chain be formed as in fig. 16.; or take away one of the pieces A, Z, in fig. 14. and Fig. 17. make the chain like thoſe of fig. 17. and 19.; or, in the laſt place, remove the whole two pieces A, Z, either in the one or the other ſide, as repreſented fig. 19. (by which means it will correſpond with fig. 17. as the whole chain *p*, *g*, *p*, *p*, may be conſidered as a ſingle moiſt conductor of the ſecond claſs). In all theſe combinations, which are repreſented by fig. 15. 16. 17. Fig. 18. & 18. and 19. the actions ariſing from the metallic con- 19. tacts are no longer contrary to each other, or in equilibrium, as they were in fig. 14.; conſequently an electric ſtream is produced, and the frog *g*, which I ſuppoſe to be properly prepared, and which forms a part of the chain, will be violently agitated as often as the circle, when broken at any one place, particularly between metal and metal, is again reſtored.

"In regard to the experiment where a moiſt conductor, or one of the ſecond claſs, is to be introduced between the two pieces A, Z (fig. 16.), that is, between two different metals, a drop of water, or a ſmall bit of moiſtened ſponge, or a thin ſtratum of any fluid, ſoap, or any other viſcous matter, will be quite ſufficient, as has been already obſerved. This ſurpriſing experiment I generally make in ſuch a manner, that, inſtead of the piece of the metal, I employ a cup or ſpoon filled with water, and then cauſe the perſon who holds the perfectly dry and pure ſtick of tin, to touch with that ſtick ſometimes the perfectly dry ſides of the ſpoon or cup, and ſometimes the water contained in them. It is wonderful to ſee, that, as by the latter method, the violent agitation of the frog never ceaſes, the firſt method, which correſponds with fig. 14. does not produce the leaſt irritation; unleſs by accident there be a ſmall drop of water, or a thin ſtratum of moiſture, at the place of contact, by which the caſe repreſented fig. 16. would be reſtored. This may ſerve to ſhew with what care and attention the experiment muſt be made, in order to guard againſt error or deception, which might ſo eaſily ariſe; and every where exhibit anomalies.

"When I introduce water or any other moiſt body, great or ſmall, not merely between one pair of metallic pieces, A, Z, as fig. 16. but between two pairs, as re- Fig. 20. preſented fig. 20. each piece of metal is between like moiſt conductors, and by theſe means all the actions are again rendered contrary, or brought into equilibrium; or, according to the other mode of viewing the matter, there is no longer any action, for want of the mutual contact of two different metals, which, as we have ſeen, is certainly neceſſary to excite an electric current: and it is always found that the frog experiences no agitation.

"I ſhall not enlarge farther on theſe combinations, which may be varied *ad infinitum* with a greater number of metallic pieces, and by which one may be enabled to foretel the phenomena which, according to my principles, will always be found to take place. It will be ſufficient, for the preſent, to draw this concluſion, that in a circle conſiſting merely of two conductors, however different they may be, their mutual contact can produce no electric ſtream ſufficient to excite ſenſibility, or muſcular movement; and that, on the contrary, this effect infallibly follows as often as the chain is formed of three conductors, one of one claſs, and two different from each other of another claſs, which come into mutual contact with each other, and that this effect will be ſtronger, the greater the difference is between the latter; that in other caſes, where there are more than three different conductors, the effect either is not produced, or will be produced in different degrees, according as the forces called forth by the different combinations, which will be expanded at each heterogeneous contact, and which are often in oppoſition, and endeavour to impel the electric fluid in oppoſite directions, are perfectly in equilibrium with each other (which muſt be a very rare caſe), or when the ſum of thoſe which exert themſelves in one direction is more or leſs exceeded by the ſum of thoſe which act in another direction.

"I ſhall here, however, leave the two complex combinations, and return to the ſimple caſes, thoſe with three different conductors, repreſented by fig. 3. which are more demonſtrative; or, in other words, thoſe with

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two different metals or conductors of the firſt claſs, which are in contact with each other, and are applied on the other ſide to moiſt conductors, or conductors of the ſecond claſs. This method has been commonly employed ſince Galvani's diſcovery, and is in exact proportion with the diverſity of metals, on which I conſider the whole phenomena to depend.

"The other method of combination, which is expreſſed by fig. 4. or that of a metal placed between two different moiſt conductors, for example, between water on the one ſide, and an aqueous, ſaponaceous, or ſaline fluid on the other, I diſcovered in the autumn of 1794; and though ſince that period I have repeated the much varied experiments of different perſons, both foreigners and others, among which was that of Humboldt, and though I wrote to ſeveral correſpondents reſpecting it, that light has not yet been thrown on this new phenomenon which it ſeems to deſerve.

"The ſingular circumſtance before mentioned, in regard to the acid taſte when the tongue is brought into contact with an alkaline liquid, belongs, as you may perceive, to this ſecond method of exciting the electric fluid, and putting it in circulation (if the tin veſſel be touched on the outſide by the hand moiſtened with water, and on the inſide by the alkaline liquor), and ſhews that this current is no leſs ſtrong and active than that excited by the firſt method, viz. by employing two ſufficiently well-choſen metals, ſuch as lead and copper, iron and ſilver, zinc and tin. I muſt here obſerve, that though with tin alone, placed between water and an alkaline liquor, you obtain nearly the effect which is produced by two of the moſt different metals, as ſilver and zinc, combined with any conductor whatever of the ſecond claſs; you can obtain the ſame, and even in a higher degree, with iron alone or ſilver alone, when the iron is introduced between water on the one ſide and nitrous acid on the other, or when the ſilver is applied between water and a ſolution of ſulphur or pot-aſh.

"If you take a frog, the head of which has been cut off, and which has been deprived of all life by thruſting a needle into the ſpinal marrow, and immerſe it, without ſkinning it, taking out the bowels, or any other preparation, into two glaſſes of water, the rump into one, and the leg into the other as uſual, it will be ſtrongly agitated and violently convulſed when you connect the water in both glaſſes by a bow formed of two very different metals, ſuch as ſilver and tin or lead, or, what is better, ſilver and zinc; but this will by no means be the caſe when the two metals are leſs different in regard to their powers, ſuch as gold and ſilver, ſilver and copper, copper and iron, tin and lead. But what is more, the effect will be fully produced on this ſo little prepared frog when you immerſe in one of the two glaſſes the end of a bow merely of tin or zinc, and into the other glaſs the other end of this bow, which has been rubbed over with a little alkali. You may perform the experiment ſtill better with an iron bow, one end of which has been covered with a drop or thin coating of nitrous acid; and beyond all expectation, when you take a ſilver bow having a little ſulphur of potaſh adhering to the end of it.

Fig. 21. "Fig. 21. repreſents the form of this experiment, where *g* is the frog; *a*, *a*, the two glaſſes with water; A, the bow formed of one ſingle metal, and *m* the drop or a thin ſtratum of a mucous, ſaline, &c. fluid, with which the bow has been rubbed over, and which on this ſide is between the metal and the water.

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"The very conſiderable difference in regard to the quntity of effect in the before-mentioned experiments already ſhews, that if the electric ſtream excited by contact is ſtrongeſt towards a certain metal, when that metal is placed between a certain fluid on the one ſide, and another fluid on the other, there are other fluids which produce a greater effect with another kind of metal; ſo that it will be neceſſary to diſcover by experiment the particular arrangement of conductors ſuited to each metal, in which the fluids or conductors of the ſecond claſs muſt be diſpoſed according to their activity. I have paid great attention to this circumſtance, and have formed ſeveral tables, which I ſhall publiſh as ſoon as I have brought them to perfection.

"I ſhall here, however, only obſerve, that in order to claſs, in ſome manner, the innumerable different moiſt conductors of this kind, I diſtinguiſh them into aqueous, ſpirituous, mucous, and gelatinous, ſaccharine, ſaponaceous, ſaline, acid, alkaline, and ſulphurous (livers of ſulphur) liquids; that I make ſubdiviſions in the acids down to the beſt known ſimple mineral acids, (as I find in this reſpect great difference between the nitrous and the muriatic acids), comprehending the principal vegetable acids and the acids of galls; and do the ſame in regard to the ſaline fluids, according as they are ſolutions of neutral ſalts, earthy ſalts, and particularly metallic ſalts.

"When it can be determined in what order all theſe kinds of fluids follow each other, in regard to the power in queſtion, for the metal A, and another for the metal B, &c. we ſhall then be in a condition to determine what place muſt be aſſigned to a great number of other heterogeneous fluids, whether mineral, vegetable, or animal, which belong to ſeveral of the above claſſes. In general, the order for the greater part of the metals hitherto obſerved is as follows: 1ſt, pure water; 2d, water mixed with clay or chalk (which ſhews a pretty different effect when the before-mentioned experiment is made with two glaſſes, a bow of tin or zinc, and a properly prepared frog, which has a ſufficient degree of vitality); 3d, a ſolution of ſugar; 4th, alcohol; 5th, milk; 6th, mucilaginous fluids; 7th, animal gelatinous fluids; 8th, wine; 9th, vinegar, and other vegetable juices and acids; 10th, ſaliva; 11th, mucus of the noſe; 12th, blood; 13th, brains; 14th, ſolution of ſalt; 15th, ſoap-ſuds; 16th, chalk-water; 17th, concentrated mineral acids; 18th, ſtrong alkaline leys; 19th, alkaline fluids; 20th, livers of ſulphur. With ſome metals there is, however, a conſiderable deviation from this order, in regard to livers of ſulphur, alkaline fluids, and the nitrous and ſaline acids.

"As to the metals, which in their poſition between theſe different fluids are more or leſs proper for the electric effect in queſtion, I have found in general, that tin exceeds all others, and that ſilver is the worſt; except when one of the fluids betwixt which the ſilver is placed is water, or any other aqueous conductor, and the other liver of ſulphur: in this caſe ſilver far exceeds zinc, and even tin. Iron alſo produces a much greater effect than any other metal, when it is in contact, on the one ſide, with mere water or an aqueous conductor,

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conductor, and on the other with the nitrous acid, were it even only a drop. The excitement occaſioned in both caſes is wonderful; ſince it exceeds, as I have already remarked, that produced, according to the uſual method, by means of a double metallic bow, even of different metals, as zinc and ſilver, applied to conductors of the ſecond claſs of the ſame kind. It is ſufficiently ſtrong and powerful to produce convulſive movements in a half-prepared frog, the bowels of which have not been taken out, when one of the two moiſt conductors is a concentrated alkaline ſolution, and the metal placed between them is zinc, or rather tin. With other metals and other fluids you can ſeldom produce convulſions in a frog, if it be not perfectly prepared, or at leaſt embowelled.

"The reader will readily perceive, that when a bow of one and the ſame metal touches with both its ends the ſame kind of ſaline water, the ſame acid, the ſame alkaline fluid, &c. an electric ſtream will not take place, as happens alſo when it touches on each ſide merely water: in that caſe two oppoſite actions are oppoſed to each other, and keep each other in equilibrium. That theſe contrary powers, however, may be in perfect equilibrium, it is neceſſary that the fluids applied to both ends of the homogeneous metalline bow be exactly of the ſame kind and of the ſame ſtrength. For this reaſon the moſt careful attention and a certain dexterity are required, in order to enſure ſucceſs to the experiment, which I have often performed to the great aſtoniſhment of the ſpectators, and which any one may repeat as was done by my friend Humboldt. That philoſopher has already publiſhed ſome of the moſt ſtriking and deciſive of theſe experiments in his ſecond letter; and I ſhall here give a more particular account of them.

"Having placed a completely or only half-prepared frog as uſual in two glaſſes of water, take a very clean bow of ſilver (it will be beſt when it has been waſhed with water from the glaſſes), and immerſe both ends of it at once, or the one after the other, in the glaſſes; no agitation of the frog will be occaſioned. Repeat the experiment, after you have daubed over one end of the bow with the white of an egg, liquid glue, ſaliva, mucus, blood, a ſolution of tartar, or any other fluid or conducting ſubſtance ſufficiently different from pure water. Firſt, immerſe the pure end, or that moiſtened merely with water, in the water of one of the glaſſes; and afterwards the other end, daubed over with the above ſubſtances, in the water of the other glaſs; you will then infallibly produce a convulſive movement in the frog, and ſeveral times in ſucceſſion, if you draw out the bow and again immerſe it until nothing more of the above ſubſtances is left adhering to the metal, or until the metal, with its ends in both the glaſſes, touches only pure, or nearly pure, water. Daub both the above ſubſtances uniformly over both ends of the bow, and immerſe them at the ſame time in both the glaſſes of water, and no convulſions will ariſe. They will often be produced in newly prepared and highly irritable frogs, when the ſaline fluid, or in general, the ſubſtance with which the two ends of the bow are daubed over, is not perfectly the ſame, or when the ſubſtance at the one end is more diluted than at the other, &c. Waſh and clean carefully the one end of the bow, daub over the other more or leſs, and convulſions will be again produced as ſoon as the circle is made complete by the double immerſion of the bow. Clean both ends completely, and no agitation will ariſe, as in the firſt experiment.

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"For comparative experiments of this kind, I would recommend viſcous fluids or ſubſtances rather than ſaline, becauſe the latter are too ſoon diſſolved in the water. It oft-times happens that the convulſions of the frog, when it is completely prepared and highly irritable, take place, though both ends of the metallic bow are daubed over with the ſame kind of ſaline fluid. The cauſe of this is, that when one end is immerſed in the water after the other (and it may be eaſily ſeen that it is impoſſible to do ſo in a moment with ſufficient accuracy), the one end of the bow loſes a portion of its ſaline ſubſtance ſooner than the other, or at leaſt the adhering part is more diluted by the water, ſo that the fluid with which both ends have been daubed over is no longer the ſame.

"For theſe experiments I would alſo recommend ſilver, as a metal that is leſs liable than others to be attacked and changed by ſaline and other liquids. Tin, lead, copper, and in particular iron, are more ſuſceptible of laſting variations; ſo that bows of theſe metals, and of iron above all, retain for a long time the power of producing convulſions in a newly prepared and highly irritable frog, even when both the ends of the bow are immerſed in two glaſſes of water, although the places of the metal, attacked by any of the ſaline fluids, have been carefully waſhed and cleaned. A ſuperficial alteration in the metal is ſufficient to produce this change, as may be eaſily ſeen. Theſe variations often ſhew themſelves to the eye by a yellow blackiſh ſpot, &c. which it is difficult to remove. I do not here ſpeak of laſting variations, that proceed to a greater depth, which can be produced in the end of the metallic bow, and particularly in iron, when its hardneſs is changed; a proceſs by which ſuch a bow can be rendered capable of producing not only convulſions in frogs, but alſo a particular ſenſation on the tongue, and light before the eyes, if both its ends, made perfectly clean, are only brought into contact with pure water. Theſe, and many other experiments of the like kind, form the chief ſubject of my firſt letter to the abbé Vaſſali, profeſſor of natural philoſophy at Turin, written in the beginning of the year 1794, and afterwards publiſhed with the other in Brugnatelli's Journal.

"If ſilver be leſs expoſed to be attacked by ſaline and other fluids (except by liver of ſulphur, which inſtantaneouſly renders it black); if it be leſs ſuſceptible of conſiderable and laſting variations, and has therefore this advantage over other metals, that it is liable to fewer irregularities; tin, on account of its greater activity, that is, the ſtrength of the effects which it produces by being brought into contact with almoſt all moiſt conductors, as I have already obſerved, is to be preferred to ſilver, and in a certain degree to all other metals. The experiment I have already deſcribed with a tin baſon filled with an alkaline fluid, and held in the hands moiſtened with water, by which an acid ſenſation is excited on the tongue when brought into contact with the above fluid, is a proof of it; for it would be vain to expect a like effect from a baſon of lead, iron, or copper, and much more ſo from one of ſilver. With the latter it would be obtained only when it con-

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tained liquid liver of ſulphur; and in that caſe the acid taſte would be pretty ſtrong.

" The electric fluid is excited alſo with the greateſt ſtrength and activity, when the metal is tin, between water and a ſaline fluid: but it will be excited with ſtill greater energy to produce an acid ſenſation on the tongue when the tin is between water and an inſipid mucilaginous fluid; or when the experiment is made with a tin baſon filled with a ſolution of gum, liquid glue, white of an egg, &c. The other metals, in like circumſtances, produce ſome effect, but much weaker: ſilver produces the weakeſt, except with liver of ſulphur, as I have already obſerved.

" A like experiment, which I made three years ago, and exhibited to various perſons, not with two different fluids and one metal, as in that above deſcribed, but contrariwiſe, with two metals of a different kind and a fluid, is already known. I took a baſon of tin (one of zinc is better), placed it on a ſilver ſtand, and filled it with water. When any of the perſons in company applied the tip of his tongue to the water, he found it perfectly taſteleſs as long as he did not touch the ſilver ſtand; but as ſoon as he laid hold of the ſtand, and graſped it in his hands well moiſtened, he experienced on the tongue a very perceptible and pretty ſtrong acid taſte. This experiment will ſucceed, though the effect is proportionably weaker, with a chain of ſeveral perſons who hold each other's hands, after they have been moiſtened with water, while the firſt applies the tip of his tongue to the water in the baſon, and the laſt lays hold with his hands of the ſilver ſtand.

" If theſe experiments, in regard to the taſte excited on the tongue by the action of two different metals, are ſtriking, the others, in regard to the taſte excited, modified and changed by one metal between two different fluids, are no leſs ſo, and they are alſo newer. They are ſtill intereſting on this account, that they diſcover to us the cauſe of that taſte often perceived in water and other liquids, which is more or leſs conſiderable or various when drunk from veſſels of metal, and particularly of tin. When the outer extremity of the veſſel is applied to the under lip, rendered moiſt by the ſaliva, and the tongue is extended ſo as to be in contact with the water, beer, wine, &c. in the veſſel, or when the tongue is bent as is done in drinking, is there not then a complete circle, and is not the metal between two more or leſs different liquids, that is, between the ſaliva of the under lip and the liquor in the cup or veſſel? A ſtronger or weaker electric ſtream muſt thereby be occaſioned, according as the fluids are different—a ſtream which will not fail in its way to affect the ſenſible organs of the tongue in the ſaid circle.

" Beſides the two methods already conſidered, of producing an electric current, that is, by means of one or more moiſt conductors, or conductors of the ſecond claſs, placed between two different metals or conductors of the firſt claſs; or contrariwiſe by means of a conductor of the firſt claſs placed between two of the ſecond claſs, alſo different; there is ſtill a third method of exciting the electric fluid, though in a degree ſo much weaker, that it is ſcarcely capable of cauſing convulſions in a perfectly prepared frog, in which there is ſtill a ſtrong degree of vitality. This new method conſiſts in forming the circle of three different conductors, all of the ſecond claſs, without the intervention of one of the firſt or a metal one. Some think they find in this method a ſtrong objection againſt my principle. Effects of Galvanism on Animals.

Fig. 22. repreſents this third method compared with the other two. In the experiments of Profeſſor Valli, reſpecting which ſo much noiſe has been made without any reaſon, *t* repreſents the leg of the frog, and particularly the hard tendinous part of the *muſculus gaſtrocnemius*; *m* the rump, or the muſcles of the back, or the iſchiatic nerves, to which the ſaid tendinous parts are applied; and *a* the blood, or the viſcous ſaponaceous or ſaline fluid, applied to the point of contact. Fig. 22.

" I have fully deſcribed this new method, where no metal is uſed, in my third and fourth letter to Profeſſor Vaſſali, written in the autumn and winter of the year 1795. I have there ſhewn, that theſe new facts, far from altering my ideas and principles, ſerve rather to eſtabliſh them; and that they render more general the principle that the conductors, by heterogeneous contact, that is, of two different from each other, become exciters of electricity, and confirm the beautiful law ariſing from it, that to produce an electric ſtream, the circle muſt neceſſarily be formed of three different conductors. You now ſee in what the whole ſecret, the whole magic conſiſts; and that it depends not merely on metals, as might have been believed, but on all the different conductors. As long as we adhere to theſe principles, it will be eaſy to explain all the before-mentioned experiments without being reduced to the neceſſity of having recourſe to any imaginary principle, or any peculiar and active electricity of the organs. By their aſſiſtance you will be enabled to invent new experiments, and to foretel the reſult of them, as I have ſeveral times done, and ſtill do daily. If you, however, abandon theſe principles, you will find nothing but uncertainty and contradiction, and the whole will be an inexplicable problem.

" Some new facts, he obſerves in a farther communication, lately diſcovered, ſeem to ſhew that the immediate cauſe which excites the electric fluid, and puts it in motion, whether it be an attractive or a repulſive power, is to be aſcribed much rather to the mutual contact of two different metals, than to their contact with moiſt conductors. But, though it cannot be denied, that in the latter caſe there exiſts an action, it is proved that it exerts itſelf in a far more conſiderable degree when the two metals mutually touch each other. There ariſes by the mutual contact, for example, of ſilver and tin, an action or power by which the former communicates the electric fluid, and the latter receives it; or the ſilver ſuffers it to eſcape, and the tin attracts it. This produces, when the circle is rendered complete by moiſt conductors, a ſtream, or continual circulation of the fluid. When the circle is complete, there is an accumulation in the tin at the expence of the ſilver; which indeed is very ſmall, and far under the point neceſſary to enable it to announce itſelf by the moſt delicate electrometer. I have however been able, by the aſſiſtance of my condenſer, conſtructed on a new plan, and ſtill better by NICHOLSON'S doubler, to render it very perceptible: I ſhall here communicate the reſult obtained by my experiments, which I made ſome time ago with great ſatisfaction.

" *Experiment* I. The three plates of the doubler are of braſs. I took two ſtrong wires, one of ſilver and the

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the other of tin, and brought the former into contact with the moveable plates, and the other with one of the fixed plates; while they both reſted on the table, or, what is better, on moiſt paſteboard, or any other moiſt conductor, ſo as to be in communication by the intervention of one or more conductors of the ſecond claſs. I ſuffered the apparatus to remain ſome hours in this ſtate, then removed the two wires, and put the machine in motion. After 20, 30, or 40 revolutions (or more when the atmpoſphere was not dry, or the inſulation imperfect), I brought one of my ſtraw electrometers into contact with the moveable plate, and obſerved indications of poſitive electricity (+ E), which aroſe to 4, 6, 10 degrees, and more. If I ſuffered it to touch the fixed plates, I had the correſponding indications of the oppoſite kind of electricity (—E).

" The ſilver, therefore, poured the elaſtic fluid into the braſs plate, when it had been ſome time in contact with it; and the tin attracted it from the other plate, which was alſo of braſs, while in contact with it. This was confirmed by the following experiment, which is a real *experimentum crucis*.

" II. I reverſed the experiment, ſo that the ſilver was in contact with one of the fixed plates, and the tin with the moveable one. The electricity which I obtained from the latter, after the apparatus had remained a ſufficient time in that poſition, was negative (—E); while that of the fixed plate was poſitive (+E).

" III. I applied only the tin wire to the moveable plate, and inſulated the two fixed ones, or brought them into communication with the table or any other moiſt conductors with which the tin wire was in contact. This ſimple contact of the tin with the braſs of which the moveable plate conſiſts, is ſufficient to excite in it a very ſmall degree of negative electricity; only a longer time is required.

" Thoſe acquainted with the action of electric atmoſpheres, and the conſtruction of the doubler, will need no farther explanation, to enable them to comprehend the mode of action of this very ingenious inſtrument; how the electricity, once obtained from the moveable plate, muſt occaſion an oppoſite kind in the fixed plate, and *vice verſa*; how the oppoſite kinds of electricity are increaſed by each revolution of the machine, &c. In the preſent experiment, therefore, when the moveable plate is — E, the fixed plate muſt be +E.

" IV. This is the reverſe of the former. The piece of tin was applied to one of the fixed plates, and the metallic one was inſulated from all metallic contact. The reſult was now reverſed; that is, the fixed plates were electrified negatively, and the moveable one had poſitive electricity.

" All theſe experiments ſucceed much better, and in a ſhorter time, if, during the mutual contact of the different metals, the moveable plate be oppoſite to either of the other two that are fixed; but ſtill better when a piece of thick paper, ſuch as a card, not moiſt, and of a thickneſs equal to the intermediate ſpace, is placed between the two plates that ſtand oppoſite to each other. It is of advantage to leave the card ſome time in its place, and not to remove it till the moment when the metals in contact are removed and the machine put in motion. To render the inſulation complete, and make the contact of the metals immediate, without the leaſt moiſture, which would be highly prejudicial, it will be proper to place the apparatus in the ſun. Half an hour, and often leſs, will then be ſufficient to obtain the required electricity, &c.; whereas, in other caſes, ſeveral hours are neceſſary before the deſired reſult can be obtained. This experiment is repreſented in fig. 23. 24. 25. and 26. LLL (fig. 22. and 23.) are the three braſs plates of the doubler; A the piece of ſilver which is in contact with one of theſe plates; E the piece of tin applied to the other plate, which is oppoſite to the former; *a a*, the moiſt conductor, or chain of moiſt conductors which form a communication with the pieces of metal. When the ſilver, as in fig. 23. is in contact with the anterior moveable plate, it gives up to it a little of the electric fluid, and the latter accumulates as much of it as poſſible; conſequently the electricity of the plate becomes poſitive, as the ſign + of the plate ſhews: whereas the tin attracts the electric fluid from the correſponding fixed plate, which by theſe means has negative electricity, as the ſign (—) of the plate indicates; and it even communicates this electricity to the other fixed plate, which therefore has the ſign (—) alſo. Fig. 23.

" In fig. 24. every thing is reverſed: the moveable plate is negatively electrified (—E), while the two fixed plates become poſitive (+E). Fig. 24.

" Laſtly, in the 25th and 26th figure, it is ſeen that the tin abſtracts the electric fluid from the braſs plate with which it is in contact. This plate is therefore negatively electrified, or has — E; and by the action of its atmoſphere occaſions poſitive electricity (+E) in the other plate ſtanding oppoſite, which is in communication, either with the third plate, as fig. 25, or, what is ſtill better, with other conductors, as fig. 26. Theſe oppoſite electricities increaſe afterwards with each revolution of the machine; the action of which, according to the theory of electric atmoſpheres, produces this effect to the degree mentioned, and juſtifies the appellation of doubler of electricity, which has been given to this inſtrument. Fig. 25. & 26.

" I now come to the experiments, which ſhew that we are to ſeek for the cauſe which calls forth the action of the electric fluid; which excites it, of whatever kind it be; determines its tranſition, &c. much rather in the mutual contact of the metals, than in the contact of the moiſt conductors with theſe metals. Though, according to every circumſtance, we muſt admit ſome action of this kind in the latter contact, it cannot be denied that the former is certainly the moſt effectual. At preſent I ſhall only mention the two following experiments, which I contrived in ſuch a manner that they may ſerve to explain a queſtion of this kind.

" V. I left the two fixed plates of braſs without making any alteration; took off the third moveable plate, and ſupplied its place by one of tin; and arranged the machine in ſuch a manner, that the latter ſtood oppoſite to one of the other two plates. I then applied to this tin plate a bit of braſs, and to the oppoſite fixed plate of braſs a piece of tin. After a convenient time, (for example an hour, when the weather was perfectly dry), I took away the two pieces of metal, or only that of braſs, and made the moveable plate of tin, which

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which was in contact with the piece of brass, to revolve about 30 times. It then gave me very perceptible marks of positive electricity.

" VI. I reversed the former experiment, and made the piece of brass touch the brass plate, and the piece of tin the plate of the same metal. I, however, obtained nothing, or almost nothing; even when the apparatus was left a much longer time in that situation, and when the machine had made twice or three times as many revolutions.

Fig. 27. " These two experiments are represented by fig. 27. and 28.; where L is the piece of brass, E that of tin, and *a a* the moist conductors which connect the two different pieces of metal.

Fig. 28. " In the arrangement of fig. 28. the same contact of different metals, viz. brass on the one side, and tin on the other, with the same kind of moist conductor, takes place, as well as in the preceding experiment of fig. 27. The addition of the electric fluid in the one, and the abstraction of it in the other, ought therefore equally to take place, though in an inverted order, when the action on the fluid calls forth the moving power, by this contact of the two metals L, E, with the moist conductor between them; and yet this is not the case, as no signs of electricity are obtained even after a long time, and when the machine has been caused to make twice or three times as many revolutions. The condition essentially necessary to obtain electricity is, that the different metals must be in contact with each other, which is the case in fig. 27. but not in fig. 28.

" When the machine has been repeatedly turned, something may be obtained. This arises either from small remains of old electricity, which could not be destroyed or dissipated in the time during which the arrangement of fig. 26. was continued; or even from fresh electricity, which the moveable plate may have obtained from the atmosphere or vapours during the pretty considerable time of the machine being in a state of revolution; or some accidental difference, either between the two tin or the two brass pieces, may be the cause of some action on the electric fluid, or of some derangement in regard to the equilibrium. In the last place, the contact of the moist conductor with the tin on the one side, or with the brass on the other, may have a different action, which, in my opinion, must be very small, but yet is not entirely without effect.

" As it is now proved that, according to the arrangement of the sixth experiment, nothing, or almost nothing, is obtained by 40, 60, and even 80 revolutions of the doubler, while a great deal is obtained by that of the fifth with 20 or 30, we must therefore conclude that the contact of two metals of a different kind with moist conductors, without the mutual contact of these metals themselves (which is wanting in the sixth experiment, where brass is in contact with brass, and tin with tin), produces nothing, or almost nothing; and that, on the contrary, the mutual contact of the two metals of a different kind, which takes place in the fifth experiment, produces the whole, or almost the whole effect * "

* *Phil. Mag.* vi. 50, 163, 306.

32 Experiments of Fowler.

Dr Fowler instituted an elaborate series of experiments on this subject, in which he confirmed and extended many of the results which had been already obtained in the experiments and investigations of other naturalists. He found that metallic substances were the best agents or conductors, and he concluded that the contact of two dissimilar metals is an essential condition in the production of the phenomena of galvanism. It did not indeed escape his observation, that in some cases a single metal produced muscular contraction, but this he ascribed to mechanical stimulus, which excited a painful sensation in the animal, not quite dead, or to the impurity of the metal, containing some portion of alloy, or solder. Future observation, however, proved that these motions could be produced without any metal whatever. He found that the most powerful effects were produced by employing zinc, in combination with gold or silver. By means of these metals he produced contractions twenty-four hours after they had ceased. In the experiment by which this was established, the nerve was coated with tin, and a different metal was employed to complete the circle between the coating and the muscle. The same philosopher also found that the effects were increased in proportion to the bulk of the metals employed, and the extent of surface brought into contact; that a communication might be formed between the metals in contact, and the nerves of the animal which were exposed, by means of water; and that the temperature of the season and the nature of the animal's death seemed to have considerable influence on the duration of the phenomena. In many cases he was able to produce contractions in a frog, after three days had elapsed from the time that the head had been separated from the body. He seems to have directed his attention particularly to the conducting power of the substances employed in galvanic apparatus, and in tracing the analogy between this property and electricity. Although metals were found to be good conductors, this was not the case with the metallic oxides, or with the salts which have these oxides for their basis.

An earth-worm placed on a circular piece of zinc, exhibited contractions similar to those produced in living frogs, when a piece of silver was brought in contact to complete the circle. Worms of the same kind, suspended across a silver rod, and the head and tail being at the same time brought in contact with a piece of zinc, sustained a shock which seemed to pass through the whole body. A similar experiment, followed by the same result, was made on leeches. If an earth-worm or leech be placed on a piece of silver, resting on a plate of zinc, the animal experiences a painful sensation, when any part of its body comes in contact with the zinc. It seems to have the same disagreeable sensation when it is placed on the zinc, and any part of the body is brought into contact with the silver.

The inquiries of the same philosopher were also directed to ascertain whether the nerves in general are all equally subject to the galvanic influence, or whether its effects are limited to those which are subject to the power of the will. With this view the heart of a cow was separated from the body, soon after the animal was killed, and prepared in the way which has been already described, in the preparation of frogs; and while the contractions of the auricles still continued, the intercostal nerve being coated, and the apparatus arranged, the metals were brought into contact, but seemed to have no effect whatever on the contractions while they continued, and after they had ceased, had not the power of renewing them. He failed in many similar attempts on hot-

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hot-blooded animals, but ſucceeded in producing muſcular contractions in part of a frog, after an hour had elapſed from the time that the natural motions had ceaſed. He made a ſimilar experiment on the heart of a cat which had been drowned in warm water, and he found that in this caſe the motion of the heart could be excited by means of galvaniſm; but when the animal was drowned in cold water, no effect could be produced.

33 Effects on the organs of the ſenſes.

It was another object of his inveſtigations, to aſcertain the effects of galvaniſm on the organs of the ſenſes. The diſagreeable taſte which remains on the tongue, when two diſſimilar metals, the one placed on the upper ſurface, and the other touching the under ſurface, are brought into contact, has been already taken notice of, and the method of applying the metals particularly deſcribed. The ſtrongeſt impreſſion, it was obſerved, was produced, when gold and zinc were employed. He introduced a metallic ſubſtance of a different kind into each ear, and having formed a communication between them, he experienced a ſhock in the head when theſe two metals were brought into contact. A bit of tin-foil was placed on the point of the tongue; the rounded end of a ſilver pencil caſe was applied to the internal angle of the eye; and when the other extremity of the pencil caſe and the tin-foil on the tongue were brought into contact, he perceived a flaſh of pale light, as well as the metallic taſte in the tongue which is produced in a preceding experiment. The flaſh ſeemed moſt vivid when gold and zinc were employed. A ſimilar effect is produced by introducing one of the metals between the upper lip and the gum, and the other between the under lip and the gum, and retaining them in this poſition to bring the edges in contact: or, by inſerting one of the metals into the noſe, and placing the other on the tongue, to form the communication between them.

34 Experiments by Robiſon.

Similar experiments were made by the late Profeſſor Robiſon of Edinburgh. He particularly obſerved, that the effects of the galvanic fluid were more ſenſibly felt when one of the conducting metals was placed on a wound, or on the nerve of a carious tooth. From the peculiar impreſſion on the tongue on the application of gold or ſilver trinkets, he could aſcertain whether any ſolder was employed about them.

In another experiment the ſame philoſopher ſeemed to think that he had proved that the effect was produced even before the metallic conductors were brought into direct contact. A piece of zinc was introduced between the gums and cheek on one ſide of the head, and a piece of ſilver was placed in the ſame way on the other ſide of the head. A rod of zinc was then applied to the zinc piece, and a rod of ſilver to the ſilver piece on the different ſides of the head; the extremities of theſe rods which projected from the mouth were then cautiouſly brought into contact; and, as ſoon as this was completed, a ſtrong ſenſation was produced in the gums. But before the direct contact was made between the extremities of the rods, he perceived a flaſh of light which was repeated when the rods were again ſeparated to a ſmall diſtance from each other. It is ſcarcely neceſſary to add, that when the arrangement of the rods was reverſed, the effects ceaſed; that is, when the zinc rod was ſubſtituted for the ſilver rod, and the ſilver one for that of zinc.

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To the account of the experiments on animals now given, which were chiefly made on cold-blooded animals, we ſhall now add thoſe of Aldini, the nephew of Galvani, which were made on the body of a man executed in London for murder. This man who was executed on the 17th January 1803, was 26 years of age, and ſeemed to have been of a ſtrong, vigorous conſtitution. The body was expoſed for an hour to a temperature two degrees below the freezing point Fahrenheit, at the end of which it was conveyed to a houſe not far diſtant, where the apparatus for the experiments had been arranged. The following is the account of theſe experiments in the author's own words.

35 Aldini's experiments on the body of a malefactor.

"*Experiment* 1.—One arc being applied to the mouth, and another to the ear, wetted with a ſolution of muriate of ſoda (common ſalt), galvaniſm was communicated by means of three troughs combined together, each of which contained 40 plates of zinc, and as many of copper. On the firſt application of the arcs the jaw began to quiver, the adjoining muſcles were horribly contorted, and the left eye actually opened.

"*Exper.* 2.—On applying the arc to both ears, a motion of the head was manifeſted, and a convulſive action of all the muſcles of the face; the lips and eyelids were alſo evidently affected, but the action ſeemed much increaſed by making one extremity of the arc to communicate with the noſtrils, the other continuing in one ear.

"*Exper.* 3.—The conductors being applied to the ear and to the rectum, excited in the muſcles contractions much ſtronger than in the preceding experiments. The action even of thoſe muſcles furtheſt diſtant from the points of contact with the arc was ſo much increaſed as almoſt to give an appearance of reanimation.

"*Exper.* 4.—In this ſtate, wiſhing to try the power of ordinary ſtimulants, I applied volatile alkali to the noſtrils and to the mouth, but without the leaſt ſenſible action; on applying galvaniſm great action was conſtantly produced. I then adminiſtered the galvanic ſtimulus and volatile alkali together; the convulſions appeared to be much increaſed by this combination, and extended from the muſcles of the head, face, and neck, as far as the deltoid. The effect in this caſe ſurpaſſed our moſt ſanguine expectations, and vitality might, perhaps, have been reſtored, if many circumſtances had not rendered it impoſſible.

"*Exper.* 5.—I next extended the arc from one ear to the *biceps flexor cubiti*, the fibres of which had been laid bare by diſſection. This produced violent convulſions of all the muſcles of the arm, and eſpecially in the *biceps* and the *coraco-brachialis*, even without the intervention of ſalt-water.

"*Exper.* 6.—An inciſion having been made in the wriſt, among the ſmall filaments of the nerves and cellular membrane, on bringing the arc into contact with this part, a very ſtrong action of the muſcles of the fore-arm and hand was immediately perceived. In this, as in the laſt experiment, the animal moiſture was ſufficient to conduct the galvanic ſtimulus without the intervention of ſalt-water.

"*Exper.* 7.—The ſhort muſcles of the thumb were diſſected,

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diſſected, and ſubmitted to the action of the galvanic apparatus, which induced a forcible effort to clench the hand.

"*Exper.* 8.—The effects of galvaniſm in this experiment were compared with thoſe of other ſtimulants. For this purpoſe, the point of the ſcalpel was applied to the fibres, and even introduced into the ſubſtance of the *biceps flexor cubiti*, without producing the ſlighteſt motion. The ſame reſult was obtained from the uſe of cauſtic volatile alkali and concentrated ſulphuric acid. The latter even corroded the muſcle, without inducing it to action.

"*Exper.* 9.—Having opened the thorax and the pericardium, expoſing the heart *in ſitu*, I endeavoured to excite action in the ventricles, but without ſucceſs. The arc was firſt applied upon the ſurface, then in the ſubſtance of the fibres, to the *carneæ columneæ*, to the *ſeptum ventriculorum*, and laſtly, in the courſe of the nerves by the coronary arteries, even with ſalt water interpoſed, but without the ſlighteſt viſible action being induced.

"*Exper.* 10.—In this experiment the arc was conveyed to the right auricle, and produced a conſiderable contraction, without the intervention of ſalt water, but eſpecially in that part called the *appendix auricularis*; in the left auricle ſcarcely any action was exhibited.

"*Exper.* 11.—Conductors being applied from the ſpinal marrow to the fibres of the *biceps flexor cubiti*, the *gluteus maximus*, and the *gaſtrocnemius*, ſeparately, no conſiderable action in the muſcles of the arm and leg was produced.

"*Exper.* 12.—The ſciatic nerve being expoſed between the great trochanter of the femur and the tuberoſity of the iſchium, and the arc being eſtabliſhed from the ſpinal marrow to the nerve diveſted of its theca, we obſerved to our aſtoniſhment, that no contraction whatever enſued in the muſcles, although ſalt water was uſed at both extremities of the arc. But the conductor being made to communicate with the fibres of the muſcles and the cellular membrane, as ſtrong an action as before was manifeſted.

"*Exper.* 13.—By making the arc to communicate with the ſciatic nerve and the gaſtrocnemius muſcle, a very feeble action was produced in the latter.

"*Exper.* 14.—Conductors being applied from the ſciatic to the peronæal nerve, ſcarcely any motion was excited in the muſcles.

"*Exper.* 15.—The ſciatic nerve being divided about the middle of the thigh, on applying the conductors from the biceps flexor cruris to the gaſtrocnemius, there enſued a powerful contraction of both. I muſt here obſerve that the muſcles continued excitable for ſeven hours and a half after the execution. The troughs were frequently renewed, yet towards the cloſe they were very much exhauſted. No doubt, with a ſtronger apparatus we might have obſerved muſcular action much longer; for, after the experiments had been continued for three or four hours, the power of a ſingle trough was not ſufficient to excite the action of the muſcles: the aſſiſtance of a more powerful apparatus was required. This ſhows that ſuch a long ſeries of experiments could not have been performed by the ſimple application of metallic coatings. I am of opinion that, in general, theſe coatings, invented in the firſt inſtance by Galvani, are paſſive. They ſerve merely to conduct the fluid pre-exiſtent in the animal ſyſtem; whereas, with the galvanic batteries of Volta, the muſcles are excited to action by the influence of the apparatus itſelf.

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"From the above experiments there is reaſon to conclude:

36 Concluſions from them.

"1. That galvaniſm, conſidered by itſelf, exerts a conſiderable power over the nervous and muſcular ſyſtems, and operates univerſally on the whole of the animal economy.

"2. That the power of galvaniſm, as a ſtimulant, is ſtronger than any mechanical action whatever.

"3. That the effects of galvaniſm on the human frame differ from thoſe produced by electricity communicated with common electrical machines.

"4. That galvaniſm, whether adminiſtered by means of troughs or piles, differs in its effects from thoſe produced by the ſimple metallic coatings employed by Galvani.

"5. That when the ſurfaces of the nerves and muſcles are armed with metallic coatings, the influence of the galvanic batteries is conveyed to a greater number of points, and acts with conſiderably more force in producing contractions of the muſcular fibre.

"6. That the action of galvaniſm on the heart is different from that on other muſcles. For, when the heart is no longer ſuſceptible of the galvanic influence, the other muſcles remain ſtill excitable for a certain time. It is alſo remarkable that the action produced by galvaniſm on the auricles is different from that produced on the ventricles of the heart, as is demonſtrated in experiment the tenth.

"7. That galvaniſm affords very powerful means of reſuſcitation in caſes of ſuſpended animation under common circumſtances. The remedies already adopted in aſphyxia, drowning, &c. when combined with the influence of galvaniſm, will produce much greater effect than either of them ſeparately*."

* p. 8.

Excepting the experiments of Aldini which we have juſt detailed, the greater number of thoſe of which an account has been given, it has been already obſerved, were made on cold-blooded animals, and beſides, the apparatus uſually employed, was a ſingle galvanic combination. After the conſtruction of the pile was known, and ſtill more ſo after batteries in the form of troughs were invented and employed, very different effects were exhibited on the animal body, both in the dead and living ſtate.

With batteries compoſed of 200, 300, or 400 pairs of plates arranged in troughs, very powerful ſhocks will be felt when the circle is completed between the extremities of the battery by means of the two hands of any perſon, ſo that the fluid ſhall paſs through the body. This experiment may be performed by touching with one hand wetted, a wire connected with one extremity of the battery, and with the other hand alſo moiſtened a wire proceeding from the other end of the battery. Every time that the contact is made a ſhock is felt. The effect will be more powerful if round balls of braſs having braſs rods attached to them after being well wetted, be placed in the palms of the hands alſo well wetted, and a communication be eſtabliſhed between the ends of the battery. The ſame effect is produced when the circle is completed by means of a number of perſons joining hands together; but it muſt be obſerved, that each perſon muſt take care to have the

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the hands well moiſtened, otherwiſe the intenſity of the ſhock will be greatly diminiſhed, or its effect entirely obſtructed. No experiments have been made, ſo far as we recollect, to aſcertain with any degree of preciſion, how far the intenſity of the ſhock is diminiſhed by increaſing the number of perſons compoſing the circle of communication, or whether indeed, when the experiment is made with the requiſite degree of caution and attention, it ſuffers any diminution.

37 Galvanic ſhock compared.

It has been obſerved by ſome, (and ſo far as we can judge from our own feelings in numerous experiments made with a pile compoſed of 60 pairs of plates, or with a trough of 50 pairs, and ſometimes with two and four troughs of 50 pairs each combined, the obſervation which we have made coincides with that of others), that the ſhock from the galvanic battery poſſeſſed ſome peculiarity, by which the ſenſation it excited was much more diſagreeable than a ſhock of artificial electricity which ſeemed to be of no greater intenſity. But it muſt be allowed, that in the compariſon of experiments of ſuch delicacy, the reſult of which depends on the feelings, great ambiguity muſt prevail; and therefore, when the compariſon is unavoidably ſo inaccurate, it can afford no preciſe concluſion.

38 Effect on wounds.

The ſenſation is extremely unpleaſant when the ſhock of galvaniſm, even when it is very ſlight, paſſes through the fingers, if they have been ſcratched or wounded.

39 Directed through the head.

A ſlight ſhock directed through the head between the temples, produces the ſenſation of a flaſh of light before the eyes, and an irreſiſtible contraction of the muſcles of the upper eyelids, ſo that the perſon who is the ſubject of the experiment involuntarily winks every time that the circle is completed. This experiment, which ſhould be repeated with caution, is performed in the following manner: Place a bit of tin-foil which will adhere by wetting with water to the part to which it is applied, on each temple. Then having formed the communication between one end of the trough and one temple by means of a metallic conductor, flat like a ſmall button, in that part which touches the tin-foil; this is retained in contact with the tin-foil by an aſſiſtant; and by means of another aſſiſtant, another ſimilar conductor is applied to the tin-foil on the other temple. Things being thus arranged, the wire connected with the latter, is by the operator brought in contact with the other extremity of the battery, or with that part of it to which the extent or intenſity of the ſhock is to be limited. Every time that this contact is repeated, the ſenſation of the flaſh of light, and the other effects, are produced. It has been hinted above, that this experiment ſhould be performed with caution. Not more than from 12 to 20 pairs of plates ſhould be employed, at leaſt on thoſe on whom the effects of a ſmall number have not been previouſly tried; and perhaps with that number, at leaſt in the experiments of this kind which we have ſeen made, there are not many perſons who would chooſe to have them repeated on themſelves. But theſe effects, it may be added, will be more or leſs powerful in proportion to the period that the battery has continued in action with the ſame fluid.

40 Contractions.

A battery compoſed of 200 pairs of plates will produce ſtrong contractions in the limbs of a fowl or rabbit, which has been recently killed. Theſe effects may be conveniently exhibited by introducing one of the conducting wires, by means of a hook, into the mouth, or fixing it about the back part of the head of the animal, and fixing a ſimilar hook from another wire connected with the other end of the battery near the rump, ſo that the current of galvanic fluid ſhall paſs through the body. When the communication between the extremities of the battery is formed, the convulſive motions of the limbs of the animal take place, and are repeated as often as the circle is completed. Similar effects are produced on a dog or ſheep; but to induce ſtrong convulſions in the larger animals, a more powerful apparatus muſt be employed. It will be neceſſary to put in action a battery conſiſting of at leaſt 300 or 400 pairs of plates arranged in troughs.

41 Effects on dead animals.

With a battery of ſuch extent and power, the convulſive motions produced on the limbs of horſes that were ſubjected to its action, were ſo ſtrong that they could ſcarcely be reſiſted by the ſtrength of two perſons.

The head of an ox, ſoon after it was ſeparated from the body, and while it was yet warm, was acted on by ſix batteries, amounting to about 300 pairs of plates. Strong convulſive motions were produced; the eyes opened, and the pupils were greatly dilated; the ears were alſo put in motion; and the tongue drawn out and fixed to the table with an iron ſkewer which entered the wood above half an inch, was retracted with ſuch force as to detach itſelf from the ſkewer which was thrown to ſome height into the air.

It has been ſaid that the motions thus induced on the limbs of animals by means of galvaniſm, reſemble the convulſive motions of epilepſy. Perhaps the motions of animals during the ſtruggles of death may be conſidered as nearly ſimilar. Whether this be ſo or not, we have obſerved that the convulſive contractions of animals ſubjected to galvaniſm, greatly reſemble the peculiar motions of each animal in the ſtruggles of death. This obſervation however only extends to what has happened to fowls, rabbits, and ſheep; but ſo far as it goes, it has been allowed by thoſe to whom we have remarked the circumſtance to be pretty correct.

With theſe obſervations we conclude this long detail of the effects of galvaniſm on animals. This ſeemed to be neceſſary in order to give the reader a diſtinct view of what may be conſidered as the dawn of this department of ſcience; for as we have already hinted, the experiments and inveſtigations of naturaliſts were at firſt limited to its effects on animals; and from their labours an immenſe body of facts were accumulated before its chemical effects were much known or diſtinctly aſcertained. We now therefore proceed to the conſideration of the chemical effects of galvaniſm. Theſe ſhall be the ſubject of the next chapter.

Chap. III. *Of the Chemical Effects of Galvaniſm.*

In the account we propoſe to lay before our readers, of thoſe effects of the galvanic fluid which are to be conſidered as more ſtrictly chemical, we ſhall firſt ſtate more generally ſome of the experiments by means of which theſe effects are illuſtrated, and deſcribe the method of performing them, and then enter into a more particular detail of the experiments of different philoſo-

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phers which tended to improve and enlarge the knowledge of galvanism.

We ſhall limit the account of the experiments firſt alluded to above to the combuſtion of charcoal, the deflagration and combuſtion of metallic ſubſtances, the decompoſition of water and ſome other fluids, and the precipitation of metals from their ſolution in acids.

42 Combuſtion of charcoal.

Exper. 1.—With a battery compoſed of 50 pairs of plates of three or four inches ſquare, with proper management, a brilliant light may be produced from the combuſtion of charcoal. The charcoal for this experiment ſhould be well prepared, from ſome of the harder woods, ſuch as beech or boxwood. It has been ſaid that it could only be properly prepared by expoſing it to a degree of heat equal to that of a glaſshouſe furnace; but we know from experience that ſo high a temperature is by no means abſolutely neceſſary. We have prepared charcoal which was found to anſwer the purpoſe of the preſent experiment, with ſuch a heat as can be eaſily commanded in a ſmall chemical furnace. The wood which is to be converted into charcoal is divided into ſlips of about one-fourth of an inch ſquare; it is then put into a crucible, which is filled up with ſand, and may be covered with another crucible inverted, ſo as ſtill more effectually to prevent the acceſs of air. The crucible is then placed in the middle of the furnace, which is to be filled up with charcoal, and a ſtrong heat maintained for eight or ten hours. After this the charcoal will be found ſufficiently prepared, and this is of ſome conſequence to be attended to, becauſe on the complete converſion of the wood into this ſtate much of the ſucceſs of the experiment depends.

Slips of charcoal reduced to a fine point are attached to wires, which communicate with the extremities of the battery. The charcoal may be fixed to the conducting wires by means of a bit of thread, or fine iron or braſs wire, or they may be fixed in pincers, or an inſtrument ſimilar to that which is uſed for holding crayons or blacklead pencils; but in whatever way this part of the apparatus is contrived, when the two pieces of charcoal connected by means of metallic conductors with the extremities of the battery are brought into contact, combuſtion immediately takes place. The rapidity or brilliancy of this combuſtion is proportioned to the ſtrength and activity of the battery. The light produced by ſuch a battery as that we have deſcribed above, will be at times pretty vivid; but with two ſuch batteries whoſe action is combined, it is ſtill more brilliant. When four batteries, conſiſting each of 50 pairs of plates of eight inches ſquare, are employed for this experiment, nothing perhaps can exceed the brilliancy of the light which is given out during the combuſtion of the charcoal. With the ſmaller battery, the proceſs is occaſionally interrupted; but with the larger apparatus the combuſtion goes on for a ſhort time, giving out a continued and uniform brilliant light. When this is the caſe, the rays ſeem to proceed from the point where the combuſtion is going on, and exhibit all the variety of the priſmatic colours. When the pieces of charcoal are immerſed in water, and brought into contact under its ſurface, the combuſtion alſo goes on with conſiderable rapidity.

43 Of metals.

Exper. 2.—The deflagration and combuſtion of many metallic ſubſtances may be alſo effected with a battery compoſed of 50 pairs of three inch plates, and this may be done with a very ſimple apparatus. A bent wire, ſuch as we have already deſcribed, is inſerted into the perforated projecting piece of wood, at the extremity of the battery. The wire is to be bent at a right angle to that part of it which is fixed perpendicularly into the extremity of the trough, and on the horizontal part of it is placed the metallic ſubſtance to be deflagrated. A plate of copper, which muſt be perfectly clean and free from oxide, is to be connected with the other end of the battery by means of a conducting wire. When the apparatus is thus arranged, if the copper plate be brought into contact with gold or ſilver leaf, for inſtance, the combuſtion of theſe ſubſtances will take place, and this combuſtion, it is ſcarcely neceſſary to add, will be in proportion to the power of the battery and its energy. In the ſame way tin-foil, white and yellow Dutch metal, as it is called, may be ſubjected to experiment, and with a battery of moderate power, a brilliant combuſtion may be produced.

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When a battery of greater power is employed, a very brilliant and rapid combuſtion of ſteel wire can be effected. This experiment is made by ſtretching a piece of wire, ſuch as that which is uſed for the ſmaller ſtrings of muſical inſtruments, between the two metallic conductors connected with the oppoſite extremities of the battery; and thus completing the circle, the combuſtion takes place. When the experiment ſucceeds, ſeveral inches of the wire are almoſt inſtantaneouſly reduced to the ſtate of oxide. In this way the energy of the battery may be in ſome meaſure aſcertained, as it muſt be in proportion to the length of the wire which is burnt. When a very powerful battery is in action, 10 or 12 inches of ſuch wire may be completely burnt, that is, not merely made red hot, but having undergone the proceſs of combuſtion, and having paſſed from the metallic ſtate to that of oxide.

44 Decompoſition of water.

Exper. 3.—We have already deſcribed the apparatus for the decompoſition of water. To exhibit this experiment, it is only neceſſary to fill ſome of the tubes which have been mentioned for this purpoſe with water, and to complete the circle of communication between the extremities of the battery, the water in the tube to be decompoſed forming part of this circle. If the conducting wires terminating in the tube conſiſt of metals which do not readily undergo oxidation, ſuch as gold or platina, the gaſes which are the conſtituent parts of water are ſeparated from the wires, the oxygen gas from the one, and the hydrogen gas from the other, and are ſeen riſing in bubbles to the top of the tube, diſplacing a quantity of water equal to the ſpace occupied by the gaſes evolved. This proceſs goes on till the ſurface of the water falls below the conducting wire paſſing through the top of the tube; and the circle being then interrupted, the proceſs ſtops. When this is the caſe, if the two conducting wires within the tube can by any contrivance be brought into contact, a ſpark is produced, by which the gaſes are ſet fire to, and are again converted into the ſtate of water. This combuſtion is attended with an exploſion. Or if the tube be carefully taken from the apparatus under water, while the finger is placed upon the open end, and then inverted, the gas collected will riſe through the water; it may then be ſet fire to by means of a burning body, a ſimilar combuſtion will take place, attended with an exploſion.

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But if the wires terminating in the tube be of braſs or iron, or any metal which is eaſily oxidated, only one of the gaſes is collected in the tube; the other (the oxygen) combines with the metal, forming an oxide, which collects on the point of the wire.

By a very ſimple contrivance the gaſes may be collected ſeparately. With this view two tubes in which the conducting wires terminate, are employed. Theſe tubes being filled with water, muſt be inverted in the ſame baſon of water, the latter of which forms the communication between the extremities of the battery.

45 Other liquids decompoſed.

Other fluids, as oil, alcohol, ether, and ammonia in ſolution, may be alſo decompoſed by a ſimilar proceſs. For the decompoſition of oil, alcohol, and ether, the pieces of charcoal may be immerſed in veſſels containing theſe liquids; and, when they are brought into contact, the decompoſition is effected, with the formation and evolution of carbonic acid gas, which is ſeen riſing in bubbles to the ſurface.

46 Precipitation of metals.

Exper. 4.—By means of galvaniſm, and with a battery of moderate power, metals may be precipitated from their ſolutions in acids. The apparatus to be employed for this purpoſe is ſimilar to that for the decompoſition of water, and the tube is filled with a ſolution of the metallic ſalt. The communication being then eſtabliſhed, the metal is precipitated, and appears in an arboreſcent form on the point of the wire. In this way the acetate of lead, or ſugar of lead, the nitrate of ſilver, and many other metallic ſalts, may be revived.

Many other curious and amuſing experiments might have been related, but what we have now given will enable the reader to have a diſtinct notion of the chemical effects of galvaniſm. Many other of the chemical effects of the galvanic fluid are ſo cloſely connected with the peculiar views and theories of thoſe who have diſcovered and obſerved them, that we ſhall not enter into any detail of them till we come to conſider that part of the ſubject. In the mean time we ſhall occupy the remaining part of the preſent chapter with an account of ſome of the experiments on the chemical effects of galvaniſm which were obſerved by philoſophers in the earlier part of its progreſs.

Mr Cruickſhank, the inventor of the galvanic trough, very early directed his attention to this inquiry, and proſecuted it with great ardour and ſucceſs. In one of his early communications on this ſubject we have a comprehenſive view of ſome of the chemical phenomena of galvaniſm. We ſhall, therefore, give it in his own words.

47 Experiments of Cruickſhank.

"I ſhall not, ſays he, give any particular account of the apparatus employed, being a pile, and not differing materially from that in uſe. I ſhall only juſt obſerve, that it conſiſted of plates of zinc and ſilver, of about 1.6 inches ſquare, and that the number of each employed in the following experiments varied from 40 to 100, according to the power required.

"I found that a ſolution of the muriate of ammonia anſwered better for moiſtening the interpoſed papers than common water.

"When the machine was in full action, ſparks which were perfectly viſible in the day time, could be taken at pleaſure, by making a communication in the uſual way between the extremities of the pile, and a ſmall report or ſnap could be heard; the ſhock given at that time was very ſtrong, and a gold-leaf electrometer, placed in the circle of communication, was very ſenſibly affected: theſe circumſtances, ſome of which, I believe, have been already aſcertained by Meſſrs Nicholſon and Carliſle, ſhew the ſtrong reſemblance of this influence to electricity. Theſe gentlemen have likewiſe diſcovered that galvaniſm decompoſes water with much greater facility than electricity, but with phenomena ſomewhat different. Chemical Effects.

"*Exper.* 1.—A quantity of common water was introduced into a glaſs tube, being confined at each end by corks, but perfectly at one by a cement of roſin and bees-wax: pieces of ſilver wire were paſſed through the corks, and brought within an inch of each other in the fluid, their other extremities being at the ſame time connected with thoſe of the machine or pile, one with the lower zinc plate, and the other with the upper ſilver plate. In future, to avoid circumlocution, I ſhall call the wire attached to the ſilver plate, the ſilver wire, and the other the zinc wire. The tube was then placed upright in a cup containing water, with the uncemented end downwards. As ſoon as the communication was made between the extremities of the pile by the wires, a quantity of ſmall air bubbles began to aſcend from the end of the wire connected with the ſilver, as obſerved by Meſſrs Nicholſon and Carliſle; but a white cloud at the ſame time made its appearance at the one proceeding from the zinc, or the zinc wire. This cloud gradually increaſed, and aſſumed a darker colour, and at laſt it became purple, or even black. A very few air bubbles were likewiſe collected upon and aſcended from this wire, but when the machine was in full force, a conſiderable ſtream could be obſerved.

"The gas was collected, and found to be a mixture of hydrogen and oxygen, in the proportion of three parts of the former to one of the latter. No great dependence, however, was placed upon this in point of accuracy. The zinc wire was found to be much corroded, and looked as if a conſiderable portion of it had been diſſolved. As the cloud which was formed around this wire became purple on expoſure to the light, I ſuſpected it might be luna cornea, or muriate of ſilver proceeding from the ſilver, which had been ſomehow diſſolved, and afterwards precipitated in this ſtate, by the muriatic ſalts in the common water. This led to the following experiments:

"*Exper.* 2.—The glaſs tube was now filled with diſtilled water, to which a little tincture of litmus was added; when the communication was made by the wires as in the former experiment, a quantity of gas aroſe from both wires, but in the greateſt quantity from that connected with the ſilver. In a few minutes a fine red line, extending ſome way upwards, was perceived at the extremity of the zinc wire; this increaſed, and in a ſhort time the whole fluid below the point of this wire became red, the fluid, however, above the ſilver wire, looked of a deeper blue than before, the ſlight tinge of purple being deſtroyed.

"*Exper.* 3.—I next filled the tube with diſtilled water, tinged with the tincture of Brazil wood; it was no ſooner placed in the circle of communication, than the fluid ſurrounding the ſilver wire, particularly towards its extremity, became purple, and this tinge increaſed ſo faſt, that the whole fluid ſurrounding this wire, and occupying the upper part of the tube, ſoon aſſumed as deep a colour, as could be produced by ammonia.

"The portion of the fluid in contact with the zinc

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wire became very pale, and almoſt colourleſs, nor could the purple tinge extend below its upper extremity. From theſe experiments it would appear, that an acid, probably the nitrous, is produced at the wire proceeding from the zinc, and an alkali, probably ammonia, at that in contact with the ſilver. Theſe facts ſufficiently explain the action upon the ſilver wire, and the nature of the whitiſh cloud proceeding from it, and afterwards becoming purple. When lime water was employed inſtead of common or diſtilled water, the wire was likewiſe acted upon, but in a leſs degree, and the cloud had at firſt an olive colour, exactly reſembling the precipitate of ſilver by lime-water.

" The quantity of ſilver diſſolved or corroded, if I may uſe the expreſſion, in theſe experiments, was very conſiderable, and where common or diſtilled water had been employed, a ſmall portion of it remained in ſolution, which was diſcovered by the addition of the muriatic acid. Indeed a much larger quantity would probably have been ſuſpended, had it not been for the alkali generated at the ſame time, and which manifeſtly produced a precipitate at, or near, the upper extremity of the zinc wire, where, after a certain time, a dark zone or ſtratum was always formed.

" *Exper.* 4.—It is a well known fact, that hydrogen gas when heated, or in its naſcent ſtate, reduces the calces of the metals; I expected, therefore, that by filling the glaſs tube with a metallic ſolution, I might be enabled to ſeparate the hydrogen from the oxygen gas, and thus procure the latter in its ſimple or pure ſtate. With this view the tube was filled with a ſolution of the acetite of lead, to which an exceſs of acid was added, to counteract the effects of the alkali. When the communication was made in the uſual way, no gas could be perceived, but after a minute or two, ſome fine metallic needles were perceived at the extremity of the wire connected with the ſilver. Theſe ſoon increaſed, and aſſumed the form of a feather, or rather that of the cryſtals of the muriate of ammonia. The lead thus precipitated was perfectly in its metallic ſtate, and very brilliant; a little gas eſcaped from the wire connected with the zinc, and it was conſiderably corroded as uſual.

" A ſolution of the ſulphate of copper was next employed, and with the ſame reſult, the copper being precipitated in its metallic form by the wire connected with the ſilver. In this inſtance the metal did not cryſtallize, but formed a kind of button at the end of the wire, which adhered ſo completely to the ſilver, that it was found impoſſible to ſeparate it.

" The moſt beautiful precipitate, however, was that of ſilver from its ſolution in the nitrous acid. In this caſe, the metal ſhot into fine needle-like cryſtals, articulated, or joined to each other, as in the Arbor Dianæ.

" What became of the oxygen gas uſually produced in theſe experiments?

" *Exper.* 5.—A quantity of pure water mixed with diſtilled vinegar was introduced into the tube, and placed in the circle of communication; ſome gas was diſengaged from the ſilver wire, but no cloud appeared at the extremity of the zinc. After ſome time, however, a quantity of metallic ſilver was precipitated by the ſilver wire, and this precipitate at laſt became very copious; a perfectly ſimilar effect was produced, when the tube was filled with very dilute ſulphuric acid; in theſe caſes the precipitated ſilver had the appearance of ſhining ſcales, like that thrown down by copper in the uſual way. It may be proper to obſerve, that in all theſe precipitations and reductions, nothing but wires of pure ſilver were employed. The reſults in this laſt experiment were exactly what was expected; the vinegar prevented the alkali from precipitating the ſilver, diſſolved by the generated acid; in conſequence of which, when a ſufficient quantity of the metal was taken up, it was again thrown down by the ſilver wire in its metallic form.

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" *Exper.* 6.—A ſolution of the muriate of ammonia being introduced into the tube, and expoſed to this influence, a little gas was diſengaged from the ſilver wire, while the zinc one was incruſted with a ſubſtance which ſoon became black, and was found to be luna cornea. The liquor which remained in the tube after the operation had been finiſhed, was highly alkaline, and ſmelled ſtrongly of ammonia; common ſalt was decompoſed in a ſimilar manner. This experiment accounts for the decompoſition of the muriate of ſoda and ammonia, which always takes place when the papers in the pile are moiſtened with a ſolution of theſe ſalts.

" A ſolution of the nitrate of magneſia appeared to be likewiſe decompoſed by this proceſs; for after ſome time, a white powder reſembling magneſia, was precipitated on the ſurface of the ſilver wire, very little gas was diſengaged.

" *Exper.* 7.—In order to aſcertain how far this influence might be carried, provided the circle of communication was complete, two tubes were employed, and connected by a ſilver wire paſſing through corks; the tubes were filled with water and ſecured by corks; two other wires being then paſſed through theſe corks, the arc was connected with the ſilver, and the other with the zinc, at the extremity of the pile. A quantity of gas as uſual was diſengaged at the extremity of the ſilver wire, and the portion of the connecting wire in the ſame tube was partly diſſolved, and as mentioned in experiment 1ſt; but the other portion of the ſame wire in the other tube gave out gas, while the communicating zinc wire was corroded. And I make no doubt that a ſimilar effect would be produced, if any number of tubes were connected in a ſimilar manner, by which means a large quantity of gas might be procured in a ſhort time.

" Beſides ſilver wires, I likewiſe employed thoſe of copper or iron, and it did not appear that theſe were more corroded or acted upon than the ſilver; indeed, in ſome of the above experiments, not leſs than half, or three-quarters of an inch of the wire was entirely conſumed. The copper wire connected with the zinc gives out a greeniſh blue ſubſtance reſembling the nitrate of copper with exceſs of the metal, or when part of the acid has been expelled by heat, &c. In examining the gas which was procured at different times, I always found it mixed with a little oxygen gas, but ſometimes this did not exceed one-eighth of the whole in bulk; however, I paid but little attention to this part of the proceſs, for as my wires were always corroded, no concluſion with regard to the compoſition of water could be drawn from it*."

* *Nicholſ. Jour.* 4to. vol. iv. 187.

We might have here detailed a great variety of experiments,

Hiſtory. periments, which have been made to aſcertain the chemical effects of galvaniſm, and to elucidate the nature and properties of the fluid which is ſuppoſed to be concerned in theſe changes. In particular we might give an account of the later experiments and reſearches of philoſophers, in inveſtigating the formation of muriatic acid, and an alkali which is ſuppoſed to be ſoda, by means of this power. This forms one of the moſt curious ſubjects of inquiry which has yet occurred with regard to galvaniſm; but as ſome part of the inveſtigations of thoſe who have occupied their attention with this inquiry, is connected with theoretical views, we ſhall reſerve the conſideration of the whole to the ſecond part of this treatiſe, the object of which is, to give a hiſtorical detail of the progreſs of galvaniſm, with the opinions of philoſophers concerning the nature of the galvanic fluid. To this therefore we now proceed. Hiſtory.

PART II. OF THE HISTORY AND PROGRESS OF GALVANISM.

IN the firſt part of this treatiſe we have given a pretty full view of the method of conſtructing apparatus for the purpoſe of exhibiting the phenomena of galvaniſm, and we have entered at conſiderable length into a detail of the experiments which have been made, to aſcertain the effects of the galvanic fluid on animals, as well as thoſe experiments by which its chemical effects are illuſtrated, with ſome of the theoretical views and opinions of thoſe who have been engaged in reſearches concerning the properties of this fluid. It is now propoſed, in the ſecond part, firſt, to conſider the progreſſive hiſtory of galvaniſm, with the theories by which philoſophers have attempted to account for its effects; ſecondly, we ſhall endeavour to trace the analogy between artificial electricity and galvaniſm; and laſtly, give an account of the experiments and inquiries which have been made concerning the formation of muriatic acid and ſoda by means of this power. Theſe will form the ſubjects of the three following chapters.

CHAP. I. *Hiſtory of the Diſcovery and Progreſs of Galvaniſm.*

48 Firſt hint of galvaniſm.

THE firſt hint which is uſually quoted as connected with the phenomena of galvaniſm, is extracted from a book entitled the General Theory of Pleaſures, by Sultzer, which was publiſhed in the year 1767. In this work the author particularly deſcribes the experiment with two diſſimilar pieces of metal which we have related at the beginning of this treatiſe, and by which we have endeavoured to illuſtrate what is underſtood by galvaniſm, in its effects on the living body. The experiment alluded to is that in which a piece of zinc and a piece of ſilver being placed, the one in contact with the upper, and the other with the under ſurface of the tongue, and their projecting edges being brought into contact, a taſte is produced, which, the author obſerves, reſembles vitriol of iron. This ſenſation is aſcribed to a vibration of the particles of the metals affecting the nerves of the tongue.

Other hints and experiments have been quoted, which ſeem to be connected with the phenomena of galvaniſm; but as they were not proſecuted, and as no concluſion, with the view of eſtabliſhing any particular point, was deduced from them, it would be unneceſſary to give an account of them, excepting thoſe of Vaſſalli, member of the royal academy of Turin, who publiſhed in 1789, a theory on this ſubject, ſupported by a ſeries of experiments which he had inſtituted. Here he throws out a conjecture, that a proviſion has been made by nature in the ſyſtem of a living animal, by which the electricity accumulated in any particular part of the body is preſerved and retained for ſome neceſſary purpoſe of its exiſtence. It had indeed been ſuppoſed by ſome, that the animation of the blood depended on the electric fluid, but according to others, this fluid and the nervous fluid were to be conſidered as one and the ſame.

49 Galvani's diſcovery.

This ſubject was particularly inveſtigated and illuſtrated, when in the year 1791 a remarkable diſcovery which was made by Dr Galvani, profeſſor of anatomy in the univerſity of Bologna in Italy, was announced to the world. This diſcovery, like moſt others, was accidental. Some frogs deprived of the ſkin were placed upon a table near which the profeſſor happened to be engaged in experiments with an electrifying machine. The crural nerve of one of the frogs was touched by a perſon preſent, with the point of a ſcalpel during the time that the machine was working. The whole animal was thrown into convulſions. The ſame experiments were afterwards repeated with the ſame ſucceſs. Every time that the ſcalpel was applied to the nerve, while the machine was in motion, violent convulſions were produced. But when the machine ceaſed to move, on the application of the ſcalpel to the nerve no effect followed. To this accidental diſcovery this branch of ſcience owed its origin, and from the name of the diſcoverer was called *Galvaniſm.*

Since the period of this diſcovery, a great many experiments have been made, and many curious phenomena have been obſerved, which have excited much intereſt and attention among philoſophers. We ſhall now preſent our readers with a hiſtorical ſketch of the progreſs of theſe diſcoveries.

The experiment which has been mentioned was repeated by Galvani in every poſſible way he could think of. He varied it both by means of artificial and atmoſpherical electricity, and the reſult of all theſe experiments he found to be uniform and conſiſtent. When Galvani firſt began his reſearches, he ſuppoſed that the phenomena depended on common electricity, paſſing through the animals on which the experiments were made. He had obſerved that the ſame effects were produced, but in a ſmaller degree, in living frogs and in other animals, as in thoſe which had been newly deprived of life. In the courſe of ſome experiments which he made on atmoſpherical electricity, he ſuſpended ſome frogs, by means of metallic hooks fixed in the ſpine, from iron paliſades; and he obſerved that the muſcles of theſe animals were frequently and involuntarily contracted, as if they had received a ſhock of electricity. At firſt he aſcribed theſe convulſions to the

History. the changes in the ſtate of the electricity in the atmoſphere; but after a repetition of the experiments he found that he was miſtaken. He diſcovered, however, at laſt, after many ingenious experiments, that he could at pleaſure produce the convulſions, by touching two different parts of the animal, each with a piece of metal, and then bringing theſe pieces of metal into contact. The experiment may be made in the following manner. Let the crural nerve of a frog be laid bare to about an inch in extent; let a piece of zinc be placed in contact with the nerve, and let a piece of ſilver be placed on the muſcles with which the nerve communicates. Then bring the zinc and ſilver into contact, and the whole limb will be inſtantly thrown into convulſions.

After Galvani had publiſhed his experiments, the convulſions thus excited were aſcribed to the action of ſome unknown fluid to which the name *Galvaniſm* was given, or *Animal Electricity*. According to Galvani, 50 His theory. a fluid is ſecreted in the brain, the ſame with the nervous fluid; but being analogous to common electricity, might with more propriety be termed animal electricity. The conductors of this fluid are the nerves. It is carried off by them as it is ſecreted, and depoſited on the interior ſurface of the muſcular fibres, which being non-conductors of the fluid, do not permit it to paſs through them. The ſtate of the muſcular fibres exactly reſembled that of a charged Leyden jar. Their inner ſurface is electrified poſitively, and the outer ſurface is electrified negatively. The communication between the exterior and interior ſurfaces of the muſcular fibres is formed by the nerves. They convey the redundant electricity from the internal to the external ſurface, and, like the effect of the electrical ſtimulus, every diſcharge is attended with a muſcular contraction.

51 Volta's. On the other hand Volta, another philoſopher who carried his reſearches far into this ſubject, and of whoſe experiments and views we have given a long detail, adopted a different opinion. He thought that the convulſions occaſioned by the galvanic apparatus were entirely independent of the action of the nervous fluid, and were to be aſcribed to common electricity excited by the metallic conductors which are employed. Theſe different opinions were ſupported with much ingenuity in a controverſy which commenced between Galvani and Volta. The writers on galvaniſm divided themſelves into two parties. While one party maintained with Volta, that the phenomena were owing to the action of common electricity on the muſcular fibres, another party thought that they were entirely dependent upon ſomething peculiar to animal matter. By many this ſeemed to have been conſidered as the nervous fluid, which was ſuppoſed to be the ſame with, or analogous to, common electricity.

It had been long aſſerted, that porter, and ſome other liquors, drank out of a pewter pot, had a different taſte from what it has when drank out of glaſs or earthen ware. Pure mercury, it has been obſerved, retains its metallic ſplendour for a long time; but when amalgamated with any other metal, it is ſoon tarniſhed or oxidated. The Etruſcan inſcriptions on pure lead are in good preſervation to this day; whereas ſome medals of lead and tin, of no great antiquity, are much corroded, and works of metal, whoſe parts are ſoldered together by the interpoſition of other metals, ſoon tarniſh about the places where the different metals are joined. When History. the copper ſheeting of ſhips is faſtened on by means of iron nails, the nails, but particularly the copper, are readily corroded about the place of contact. A piece of zinc placed in water for a conſiderable time ſcarcely undergoes any change; but if a piece of ſilver happen to touch the zinc whilſt it is in the water, it is ſoon corroded or oxidated.

In the courſe of a very few years after the publication of Galvani's diſcovery, a great number of writers appeared, and preſented to the world a great body of facts which they had aſcertained by experiments and obſervations. The following are among the moſt important: 1. When a piece of metal is placed on the 52 Recapitulation of facts. muſcle of an animal juſt dead, and ſtill moiſt, and another piece of a different metal is placed on the nerve which leads to the muſcle, or on another part of the muſcle, and if the two pieces of metal be brought into contact, a contraction or convulſion of the muſcle takes place. 2. A ſingle piece of metal, or two pieces of the ſame metal, have no effect in exciting contraction of the muſcle. It is neceſſary to have two perfect conductors of electricity in contact, before any convulſion can be produced. 3. The muſcle muſt be moiſt. The effect is not prevented by a ligature on a nerve; but the ſuſceptibility of a muſcle to be thrown into convulſions is diminiſhed, and at laſt deſtroyed by the application of opium, which deſtroys its irritability. The ſame change takes place if the muſcle be allowed to remain for ſome time after death. 4. The different muſcles of the body are differently affected by the galvanic influence. They are not equally ſuſceptible of the ſame degree of convulſive effect. 5. If a plate of zinc be placed on the upper ſurface of the tongue, and a plate of ſilver or copper be applied to its under ſurface; and if the two pieces of metal thus placed be brought into contact, a ſtrong metallic taſte is immediately perceived. An acid taſte is perceived, when the tongue is dipt into an alkaline ſolution contained in a tin or zinc cup held in the moiſt hand. 6. If a piece of metal, as a ſilver ſpoon, be placed on the ball of the eye, and another piece of a different metal, as a piece of zinc, be placed on the tongue, and if the two pieces of metal be brought into contact, a flaſh of fire is inſtantly perceived; and it is perceived, both when the metals are brought into contact, and when they are ſeparated. 7. Another fact, which was aſcertained by Aldini, who performed a great many experiments in galvaniſm during his viſit to this country, is, that convulſions may be excited merely by forming a proper chain of muſcles and nerves. This is proved by the following experiment. He took a prepared frog, and held it ſuſpended in one hand by the foot. The ſciatic nerves were brought into contact with the tongue of an ox, the head of which had been recently ſeparated from the body. He then introduced the other hand moiſtened with a ſolution of common ſalt in water into the ear of the animal, thus completing the circle. Every time that the communication was formed, the muſcles of the frog were thrown into convulſions.

Moſt of the facts which we have now related, were aſcertained by the different philoſophers, whoſe reſearches were directed to the ſubject of galvaniſm, between the years 1791 and 1794. Hitherto the connection between galvaniſm and animal bodies was conſidered by moſt

Hiſtory. moſt writers, ſo cloſe and intimate, that they ſuppoſed the one could not exiſt independent of the other. Some facts, however, which were eſtabliſhed by Fabroni and others, ſeemed to favour the opinion of thoſe who conſidered galvaniſm as the action of a peculiar fluid on the animal fibre. This fluid is developed by the mutual action of the metals employed as exciting cauſes, and it exiſts in other bodies as well as in thoſe which are endowed with life. We have already mentioned that two pieces of different metals put into water produce changes on the water which neither of them ſeparately could effect. This was obſerved by Fabroni, from which he concluded that a chemical change was effected by the metals on each other. To this change he ſuppoſed part at leaſt of the phenomena of galvaniſm was owing. Thus he explained the neceſſity of two different metals and of moiſture in the production of theſe phenomena. Thoſe metals, he alſo obſerved, which occaſioned the moſt rapid changes on each other in water, were moſt powerful in exciting galvanic convulſions.

53 henomena galva- ſm aſcri- d to che- ical ac- n.

Metals and charcoal, it was aſcertained by Volta, being good conductors of electricity, attract and repel that fluid with different forces. When two different metals in their natural ſtate of electricity are brought into contact, electric matter paſſes from the one to the other; the one becomes electrified poſitively, and the other negatively. From this he concluded, that the electricity which occaſioned the galvanic phenomena did not reſide in the animal fibres, but in the metals employed as exciters, and that the convulſions were produced by the electric matter paſſing through theſe fibres.

The ſeeming inconſiſtency which appeared in the opinions of Volta and Fabroni was removed by ſucceeding diſcoveries, which demonſtrated that both electricity and chemiſtry were concerned in the galvanic phenomena. Galvaniſm was now no longer conſidered as ſomething connected with living matter, which was totally inexplicable, but as ſomething developed by the mutual action of inorganized ſubſtances on each other, the effect or energy of which might be eſtimated and meaſured by its action on the muſcular fibres. The diſcovery of the galvanic pile by Volta put it in the power of philoſophers to increaſe the power or energy of the galvanic influence at pleaſure. This pile, and the method of conſtructing it, have been already deſcribed.

A deſcription has alſo been given of a different apparatus, the invention of Mr Cruickſhank of Woolwich, which has been employed in place of Volta's pile. This is called the *galvanic trough*, and it conſiſts of a number of ſquare plates of different metals as in the other, which are ſoldered together in pairs, and fixed by means of cement in a box of baked wood, at a ſmall diſtance from each other.

54 Analogous to thoſe of electricity.

A ſtriking analogy was at once obſerved between this apparatus and charged electrics. A great deal of diſcuſſion took place on the ſubject; much inveſtigation followed: and philoſophers held different opinions concerning the phenomena of galvaniſm, whether it was to be conſidered as the ſame with common electricity, or as ſomething ſpecifically different.

It was at laſt aſcertained by Nicholſon and Carliſle that the zinc end of the pile was in the ſtate of poſitive electricity, and the ſilver or copper end in the negative ſtate. The zinc end of the pile, then, according to the commonly received theory of electricity, gives out the electric fluid, which enters at the ſilver or copper end. And if the circle be completed by means of metallic wires or charcoal, when the pile is ſufficiently powerful, ſparks ſimilar to what take place by the diſcharge of common electricity may be perceived. Electric batteries have been charged by means of the pile; metallic wires, tin-foil, gold leaf are burnt; and mixtures of hydrogen and oxygen gas are exploded in the ſame way as happens when electric diſcharges are made to paſs through them. From the whole of the phenomena, there ſeems now to be little doubt of the identity of the two fluids. Hiſtory.

Chemiſtry, however, has a very conſiderable ſhare in the phenomena of galvaniſm. The action of the pile is moſt powerful in oxygen gas: it ceaſes entirely in the vacuum of an air-pump, or in azotic gas. The electrical machine alſo, it has been aſcertained, cannot be excited in any gas unleſs it contain oxygen; and it ſeems probable, that the effect of the amalgam, which is employed in exciting the electrical machine, bears a proportion to the facility or rapidity of its oxidation. But we ſhall diſcuſs this point more fully in the ſecond chapter.

When the action of the pile has continued for ſome time, it gradually becomes weaker, till at laſt its energy is entirely loſt. This power can only be renewed by cleaning the plates, the ſurfaces of which have been very much changed. It was obſerved that the time in which the action of the pile ceaſed, was in proportion to the energy which it originally poſſeſſed. When it was ſtrongeſt, the duration of its action was ſhorteſt. It was obſerved alſo, that one of each pair of plates was covered with a coat of oxide; and when this proceſs of oxidation was finiſhed, and the ſurface of the plate was entirely covered, the action ceaſed. Of the two metals employed in the conſtruction of the pile, that which is moſt eaſily oxidated, always undergoes this proceſs. When zinc and ſilver, or zinc and copper, are uſed, the zinc is always oxidated; and unleſs this oxidation take place, there is no action of the pile. Its action or energy is proportional to the oxidation of the metal; and thus it appears that this oxidation is eſſentially neceſſary to the action of the pile. For, unleſs the liquid which is employed to moiſten the pieces of card or cloth between the pairs of plates, or that which fills the cells in the trough, be capable of oxidating the zinc, no action follows. There is no action at all with ſilver and zinc, and perfectly pure water. *In vacuo* the action of the pile ſoon ceaſes, even with common water; for the oxygen which is held in ſolution by the water ſoon combines with the zinc, and then the proceſs ſtops. The action is increaſed by oxygen gas, becauſe the oxidation of the zinc is facilitated. Its action is alſo increaſed, and goes on even *in vacuo*, when nitric acid, which ſupplies oxygen for the proceſs of oxidation, is ſubſtituted for the water. Thus, by eſtimating the proportion between the oxidation of the metals and the action of the pile, it may be determined what metals are proper for forming piles, and with what liquids they may be employed. In the choice of the different metals, it muſt be obſerved, that one of them muſt always be more eaſily oxidated than the other. Two perfect conductors which are unequally oxidable, with an imperfect

Hiſtory. perfect conductor which is capable of oxidating the moſt oxidable of the perfect conductors, conſtitute the elements of the galvanic battery.

But ſome of the moſt important phenomena of galvaniſm are exhibited in its chemical effects. Moſt of theſe were firſt obſerved by the chemical philoſophers of this country. We have already detailed many of the experiments by which theſe effects are illuſtrated; and we ſhall here only, for the ſake of giving a connected view of the ſubject, merely recapitulate ſome of them.

55 Recapitulation of the chemical effects. When water forms part of the circle between the extremities of the battery, and the conducting wires are brought within a ſmall diſtance of each other, being immerſed in a glaſs of water, the water is decompoſed, and it will be recollected that the phenomena are different according to the nature of the wires employed. When the wires are of gold or platina, they undergo no change; oxygen gas is evolved in ſmall bubbles from the poſitive wire, and hydrogen gas from the negative wire; and if the gaſes be collected ſeparately by the apparatus formerly deſcribed, they are found to be in the proportions of the component parts of water. If one of the wires be immerſed into one glaſs, and another into a ſeparate glaſs, by completing the circle with a finger plunged into each glaſs, the proceſs goes on, and the hydrogen gas is extricated in the one veſſel, while the oxygen is given out from the wire in the other. This fact was firſt diſcovered by Mr Davy. When ſpring water is uſed, or water having azotic gas in ſolution, an acid is formed at the extremity of the poſitive wire, and an alkali at the extremity of the negative wire. The acid was found to be nitric, and the alkali ammonia. If the wires be plunged in different glaſſes, and the connection be formed by means of an animal body, the poſitive wire produces in the water tinged with an infuſion of litmus, a red colour, while the negative wire alſo reddens an infuſion of braſil wood.

If other wires beſide thoſe of gold or platina be uſed, it is found that the poſitive wire undergoes oxidation, but little or no gas is ſeparated from it; while the negative wire, as in the former caſe, gives out hydrogen gas. When the wires are immerſed into metallic ſolutions, as acetate of lead, nitrate of ſilver, &c. the ſilver or lead is revived, and depoſited on the negative wire; and if ſolutions which contain ſulphuric, nitric, or oxymuriatic acids, are uſed for the immerſion of the conducting wires, the acids are decompoſed, oxygen gas is evolved from the poſitive wire, and ſulphur or hydrogen gas makes its appearance at the negative wire. The decompoſition of ammonia has already been mentioned. This was diſcovered by Mr Henry. The hydrogen is given out by the negative wire, while the azotic gas is evolved by the poſitive wire. When plumbago or charcoal are employed as conductors in place of metals, it is found that carbonic acid is evolved from the poſitive end, and hydrogen gas from the negative.

It may be neceſſary here to deſcribe a galvanic battery, conſtructed by Mr Davy, on principles ſomewhat different from that of Volta. In the Voltaic pile there are two perfect conductors, and one imperfect conductor; but this conſiſts of two imperfect, and one perfect conductor: the two imperfect conductors are nitrous acid and liquid ſulphuret of potaſh. A trough is divided into cells with ſlips of horn and plates of zinc, arranged alternately; nitrous acid is poured into the firſt cell, and ſulphuret of potaſh into the ſecond; the two liquids being ſeparated by the ſlip of horn, a communication is formed between them by means of a moiſt piece of cloth laid over the horn, and in the ſame way the reſt of the cells are filled. In this caſe the liquids are the imperfect conductors, and the zinc is the perfect one; and the action of the battery continues till the oxidation of one of the ſurfaces of the zinc takes place, the other ſurface remaining unchanged. Theory

Having finiſhed the ſhort view which we propoſed to give of the hiſtory and progreſs of galvaniſm, we ſhould next proceed to detail ſome of the later experiments and diſcoveries which have been made on this ſubject. What we here chiefly allude to, is the diſcovery of the formation of muriatic acid and ſoda by means of the galvanic fluid. But this is propoſed to be the ſubject of a ſeparate chapter. We ſhall therefore proceed in the next chapter to conſider the hypotheſis by means of which the phenomena of galvaniſm have been explained, and to point out the analogy between electricity and galvaniſm.

Chap. II. *Of the Theory of Galvaniſm, and the Analogy between the Galvanic Fluid and Electricity.*

We have already obſerved, that the philoſophers who were occupied in reſearches on galvaniſm, early divided themſelves into two parties. According to one party, with Volta at their head, the phenomena of galvaniſm were aſcribed to the action of common electricity on the muſcular fibres; while another party maintained the opinion that they depended entirely on ſomething peculiar to animal matter. This was the opinion of Galvani himſelf, the original diſcoverer, and it was ſupported by his nephew Aldini, with certain modifications. The greater number of philoſophers have now adopted the opinion of Volta, as being more conſiſtent with the phenomena. We ſhall therefore now give a more particular account of the hypotheſis which has been more generally followed in explaining theſe phenomena on the principles of electricity.

56 Theory of electricity. According to the received principles of electricity, there is a ſubtile fluid which exiſts in all bodies; but the exiſtence of this fluid can only be recogniſed when the proportion which a body contains is greater or leſs than the quantity which is natural to it. When the quantity is greater than uſual, the body is ſaid to be electrified *poſitively* or *plus*; and when the quantity is leſs than uſual, the body is ſaid to be electrified *negatively* or *minus*. The electric fluid penetrates certain bodies, and paſſes through them with facility, and theſe bodies are called *conductors of electricity*; but there are other bodies which it cannot paſs through without difficulty, theſe bodies are called *non-conductors* or *electrics*. Of conductors there are two kinds; one of which is denominated *perfect*, becauſe the electric fluid paſſes through them with eaſe; the other is called *imperfect* conductors, becauſe the fluid paſſes through them with difficulty. The perfect conductors are ſolid bodies which are ſuſceptible of oxidation; and when they enter into combination with oxygen, they loſe their properties as perfect conductors. The metals and charcoal

are

Theory. are the only perfect conductors which are known. The imperfect conductors are thoſe bodies which contain oxygen, and when they are deprived of it, they loſe the properties of imperfect conductors. They are all liquid bodies, and uſually contain water as one of their component parts. See ELECTRICITY.

57 Affinity of the electric fluid for conductors; There is an affinity between the perfect conductors and the electric fluid, in conſequence of which this fluid remains in combination with the perfect conductor, till it is attracted by ſome body, for which it has a ſtronger affinity, or is excelled by ſome body combining with the conductor, for which the conductor has a ſtronger affinity than it has for the electric fluid. Perfect conductors poſſeſs different forces or degrees of affinity for the electric fluid. Thus, if two perfect conductors be brought into contact, the proportion of electric matter in each of them changes. That conductor which has the ſtrongeſt affinity for the fluid, is electrified poſitively, or plus; and the conductor which has the weaker affinity is electrified negatively or minus. If a plate of zinc and one of copper, each of which poſſeſſes its natural proportion of electric fluid, be brought into contact, the zinc is electrified plus, and the copper minus; or, if iron and ſilver be brought into contact, the iron is electrified plus, and the ſilver minus; and if no other circumſtances operate to change the ſtate of the electricity, theſe two ſtates will be permanent.

But, when a perfect conductor in the poſitive ſtate of electricity, enters into combination with oxygen, it parts with the exceſs of electric fluid which it contained, and the diſcharge is made towards the ſide of the conductor which is combined with oxygen. The affinity of imperfect conductors for the electric fluid is weaker than that of the perfect conductors, ſo that, if a perfect and imperfect conductor be brought into contact, the perfect conductor becomes plus, and the imperfect, minus; and this ſtate is not changed, if the imperfect conductor cannot communicate oxygen to the perfect one.

58 Between the electric fluid and hydrogen there is alſo an affinity, ſo that the electric fluid combines with hydrogen, provided this latter be preſent when the fluid is ſeparated from a perfect conductor. The electric fluid is differently conducted through the bodies which are called perfect and imperfect conductors. The fluid paſſes through the perfect conductors, in its ſimple and uncombined ſtate; but unleſs the fluid be combined with hydrogen, it cannot paſs through the imperfect conductors, and this compound of electricity and hydrogen is capable of paſſing inviſibly through liquid conductors.

Let us now ſuppoſe a plate of copper and another of zinc, to be brought into contact, the zinc is immediately electrified plus, and the copper minus; but let us ſuppoſe alſo, that the ſurface of the zinc fartheſt from the copper, is brought into contact with a liquid which can communicate oxygen to that ſurface, ſo that it becomes oxidated, ſuch, for inſtance, is water impregnated with common air, or with an acid. As ſoon, then, as the oxygen of the imperfect conductor combines with the zinc, the exceſs of its electricity is ſeparated, and paſſes towards the imperfect conductor; but the zinc is oxidated by the decompoſition of the water, the oxygen of which combines with the metal, while the hydrogen is ſet free. The electricity of the perfect conductor enters into combination with the hydrogen, and in this ſtate it can paſs through the imperfect conductor. If then the imperfect conductor be in contact on the other ſide with a perfect conductor, ſuch as a plate of copper, which cannot, in this caſe, be oxidated, the electric fluid leaves the imperfect conductor, and enters the perfect one; but it cannot combine with a perfect conductor while it is in union with hydrogen; the hydrogen, therefore, is left behind, and, accordingly, when the electric fluid paſſes from the perfect to the imperfect conductor, a portion of hydrogen gas is given out at the ſurface of the perfect conductor; or, if that ſurface has undergone any degree of oxidation, the hydrogen combines with the oxygen, and thus leaves the conductor in the metallic ſtate. But, farther, if a plate of zinc be in contact with a plate of copper, the fluid having a greater affinity for the zinc, will enter it; and if the zinc be again followed by another imperfect conductor, its ſurface is oxidated, the electricity is diſengaged; it combines with hydrogen, and paſſes through the imperfect conductor as in the former caſe. Whatever the number of theſe ſets of bodies may be, if they are arranged in the ſame order, the ſame phenomena will be exhibited. Theory.

Let us now ſuppoſe, that a battery is conſtructed, either in the form of a pile or trough, of any given number of pairs of plates; and ſuppoſe, if this battery is in the form of a pile, that the uppermoſt plate is zinc, the loweſt is therefore of copper; the zinc is electrified plus, and the copper minus. If, then, a communication is eſtabliſhed between the upper and lower plates of the pile, by means of conductors, according to the laws of electricity, the exceſs at the top of the pile immediately paſſes to the bottom. A current of electricity, therefore, will paſs through the pile, and will continue till the ſurfaces of the zinc next the imperfect conductors are completely oxidated, when the action ceaſes, becauſe the double decompoſitions on which this action depends, can no longer take place.

59 Different effects from the number of plates, The number of repeated charges which paſs through the pile, muſt be in proportion to the number of plates, ſo that the intenſity of the pile increaſes with the number of plates of which it is compoſed. Hence it is, that the effects of galvaniſm on animals is found to be in proportion to the number of plates employed in the battery; but this depends upon its intenſity, or the number of diſcharges followed by intervals, which paſs through the body in a given time.

60 and extent of ſurface. But, on the other hand, the effect of the galvanic fluid on metallic ſubſtances depends on the abſolute quantity which paſſes through the metal in a given time. But the abſolute quantity of fluid diſcharged from a ſingle pair of plates, muſt be proportional to the ſurface of theſe plates; and hence it is, that the quantity of electricity diſcharged from a pile in a given time, depends upon the ſurface of the plates. When a battery is diſcharged, the ſmall charge contained in each pair of plates, paſſes through the diſcharger; but there muſt be an interval between each of thoſe ſeparate charges, for they cannot be ſuppoſed to paſs inſtantaneouſly, although the interval being too ſmall to be perceptible, the diſcharge of the battery ſeems to be inſtantaneous. As then the number of ſmall diſcharges which are apparently inſtantaneous, when a battery is diſcharged, is in proportion to the number of plates,

Theory. the intenſity of each little diſcharge is proportional to the places which the pair of plates occupies in the battery; and hence it is, that the ſhock is increaſed by the number of plates more rapidly than the effect of the battery on metals is increaſed; but, on the contrary, the ſurface of the plates being increaſed, the effect on metals is alſo increaſed, becauſe the quantity diſcharged at once from the upper pair is increaſed; and it ſeems to be in this way that the effect on metallic ſubſtances is produced.

61 Chemical effects. In the ſame way the chemical changes which are effected by means of galvaniſm may be explained. Let it be ſuppoſed, that a gold wire, connected with the upper plate of the battery, terminates in a glaſs of water, and another gold wire, from the lower plate of the battery, terminates in the ſame water. The circle is then completed by the gold wire, which is a perfect conductor. The current of electricity paſſes through the wire which is connected with the uppermoſt plate to the baſe of the battery, and it would paſs uninterruptedly, if there were no interval between the wires. This interval is ſupplied with water, and, when the electric fluid reaches the extremity of the wire, it muſt paſs through the water, but it can only paſs through an imperfect conductor when it is in combination with hydrogen. It therefore combines with the hydrogen of the water, which is accordingly decompoſed at the point of the wire. The oxygen is diſengaged, and the hydrogen in combination with the electricity paſſes through the water till it reach the point of the other wire; and the affinity between this wire and the electric fluid being greater than the affinity of the latter for water, the electric fluid enters the wire, and paſſes on to the other end of the battery; but the hydrogen is previouſly ſeparated from the extremity of this ſecond wire, in the form of gas, becauſe the fluid cannot enter the wire in combination with hydrogen.

If the wires are immerſed in ammonia, the hydrogen is derived from that ſubſtance of which it forms one of the component parts; the azotic gas, the baſe of which is its other conſtituent, is evolved at the extremity of the firſt wire, and hydrogen gas at the extremity of the ſecond. But, if the wires are plunged in the water which contains common air, and conſequently a certain portion of azote, as oxygen gas combines with azote in its naſcent ſtate, or at the moment of its evolution, the compound reſulting from this combination is nitric acid. Hydrogen gas alſo, in its naſcent ſtate, will combine with azote, and ammonia is the reſult of this combination. Hence it is, that in ſome experiments nitric acid is found at the point of the poſitive wire, and ammonia at the point of the negative wire, when common water is employed.

When liquids holding in ſolution a metallic ſalt, the baſe of which is an oxide of the metal, are employed; as hydrogen gas poſſeſſes the property of reducing or reviving metals, if in its naſcent ſtate it comes in contact with their oxides, the metallic ſalts are in this caſe decompoſed, and the metal is revived. It is found depoſited on the negative wire. When copper or iron wires are employed to complete the circle, inſtead of wires of gold or platina, as oxygen has the property of combining with theſe metals, at the moment of its diſengagement, it is depoſited on the poſitive wire, and in this caſe none is ſeparated from it; but if the circle be completed by means of charcoal or plumbago, and the interval between theſe conducting ſubſtances be water, carbonic acid gas is ſeparated from the poſitive conductor, becauſe the oxygen in its naſcent ſtate is ſuſceptible of combination with carbone; and the hydrogen in the ſame ſtate combining with carbone, carbureted hydrogen is given out by the negative conductor. Theory.

Such is the hypothetical explanation which has been given of the action of galvaniſm, and the phenomena which it exhibits. A fuller view of the analogy between galvaniſm and electricity has been given by Dr Wollaſton.

"Notwithſtanding, he obſerves, the power of Mr Volta's electric pile is now known to be proportional to the diſpoſition of one of the metals to be oxidated by the fluid interpoſed, a doubt has been entertained by many perſons, whether this power ariſes from the chemical action of the fluid on the metal, or, on the contrary, whether the oxidation itſelf may not be occaſioned by electricity, ſet in motion by the contact of metals that have different conducting powers.

62 Electricity evolved during oxidation. "That the oxidation of the metal is the primary cauſe of the electric phenomena obſerved, is, I think, to be inferred from the following experiments, which exhibit the galvanic proceſs reduced to its moſt ſimple ſtate.

"*Exper.* 1.—If a piece of zinc and a piece of ſilver have each one extremity immerſed in the ſame veſſel, containing ſulphuric or muriatic acid diluted with a large quantity of water, the zinc is diſſolved, and yields hydrogen gas, by decompoſition of the water; the ſilver, not being acted upon, has no power of decompoſing water; but, whenever the zinc and ſilver are made to touch, or any metallic communication is made between them, hydrogen gas is alſo formed at the ſurface of the ſilver.

"Any other metal beſides zinc, which by aſſiſtance of the acid employed is capable of decompoſing water, will ſucceed equally, if the other wire conſiſts of a metal on which the acid has no effect.

"*Exper.* 2.—If zinc, iron, or copper, is employed with gold in diluted nitric acid, nitrous gas is formed; in the ſame manner, and under the ſame circumſtances, as the hydrogen gas in the former experiment.

"*Exper.* 3.—Experiments analogous to the former, and equally ſimple, may alſo be made with many metallic ſolutions. If, for inſtance, the ſolution contains copper, it will be precipitated by a piece of iron, and appear on its ſurface. Upon ſilver merely immerſed in the ſame ſolution, no ſuch effect is produced; but as ſoon as the two metals are brought into contact, the ſilver receives a coating of copper.

"In the explanation of theſe experiments, it is neceſſary to advert to a point eſtabliſhed by means of the electric pile.

"We know that when water is placed in a circuit of conductors of electricity, between the two extremities of a pile, if the power is ſufficient to oxidate one of the wires of communication, the wire connected with the oppoſite exremity affords hydrogen gas.

"Since the extrication of hydrogen, in this inſtance, is ſeen to depend on electricity, it is probable, that in other inſtances, electricity may be alſo requiſite for its converſion into gas. It would appear, therefore, that in the ſolution of a metal, electricity is evolved during the

Theory. the action of the acid upon it; and that the formation of hydrogen gas, even in that case, depends on a transition of electricity between the fluid and the metal.

"We see, moreover, in the first experiment, that the zinc, without contact of any other metal, has the power of decomposing water; and we can have no reason to suppose that the contact of the silver produces any new power, but that it serves merely as a conductor of electricity, and thereby occasions the formation of hydrogen gas.

"In the third experiment also, the iron by itself has the power of precipitating copper, by means, I presume, of electricity evolved during its solution; and here likewise the silver, by conducting that electricity, acquires the power of precipitating the copper in its metallic state.

"The explanation here given receives additional confirmation from comparative experiments which I have made with common electricity; for it will be seen, that the same transfer of chemical power, and the same apparent reversion of the usual order of chemical affinities in the precipitation of copper by silver, may be effected by a common electrical machine.

"The machine with which the following experiments were conducted, consists of a cylinder seven inches in diameter, with a conductor on each side, 16 inches long, and three and a half inches diameter, each furnished with a sliding electrometer, to regulate the strength of the spark received from them.

"*Exper.* 4.—Having a wire of fine silver $\frac{1}{110}$ of an inch in diameter, I coated the middle of it for two or three inches, with sealing wax, and by cutting through in the middle of the wax, exposed a section of the wire. The two coated extremities of the wire, thus divided, were immersed in a solution of sulphate of copper, placed in an electric circle between the two conductors; and sparks, taken at $\frac{1}{10}$ of an inch distance, were passed by means of them through the solution. After 100 turns of the machine, the wire which communicated with (what is called) the negative conductor, had a precipitate formed on its surface, which, upon being burnished, was evidently copper; but the opposite wire had no such coating.

"Upon reversing the direction of the current of electricity, the order of the phenomena was of course reversed; the copper being shortly re-dissolved by assistance of the oxidating power of positive electricity, and a similar precipitate formed on the opposite wire.

"*Exper.* 5.—A similar experiment made with gold wires $\frac{1}{100}$ of an inch diameter, in a solution of corrosive sublimate, had the same success.

"The chemical agency, therefore, of common electricity, is thus proved to be the same with the power excited by chemical means; but, since a difference has been observed in the comparative facility with which the pile of Volta decomposes water, and produces other effects of oxidation and de-oxidation of bodies exposed to its action, I have been at some pains to remove this difficulty, and can at least produce a very close imitation of the galvanic phenomena, by common electricity.

63 Effects of galvanism imitated by electricity.

"It has been thought necessary to employ powerful machines, and large Leyden jars, for the decomposition of water; but when I considered that the decomposition must depend on duly proportioning the strength of the charge of electricity to the quantity of water, and that the quantity exposed to its action at the surface of communication depends on the extent of that surface, I hoped that, by reducing the surface of communication, the decomposition of water might be effected by smaller machines, and with less powerful excitation, than have hitherto been used for that purpose; and, in this hope, I have not been disappointed.

Theory.

"*Exper.* 6.—Having procured a small wire of fine gold, and given it as fine a point as I could, I inserted it into a capillary glass tube; and after heating the tube, so as to make it adhere to the point and cover it in every part, I gradually ground it down, till, with a pocket lens, I could discern that the point of the gold was exposed.

64 In decomposing water,

"The success of this method exceeding my expectations, I coated several wires in the same manner, and found, that when sparks from the conductors before-mentioned were made to pass through water, by means of a point so guarded, a spark passing to the distance of one-eighth of an inch would decompose water, when the point exposed did not exceed $\frac{1}{100}$ of an inch in diameter. With another point, which I estimated at $\frac{1}{1300}$, a succession of sparks $\frac{1}{20}$ of an inch in length, afforded a current of small bubbles of air.

"I have since found, that the same apparatus will decompose water, with a wire $\frac{1}{40}$ of an inch diameter, coated in the manner before described, if the spark from the prime conductor passes to the distance of $\frac{4}{10}$ of an inch of air.

"*Exper.* 7.—In order to try how far the strength of the electric spark might be reduced by proportional diminution of the extremity of the wire, I passed a solution of gold in *aqua regia* through a capillary tube, and, by heating the tube, expelled the acid. There remained a thin film of gold, lining the inner surface of the tube, which, by melting the tube, was converted into a very fine thread of gold, through the substance of the glass.

"When the extremity of this thread was made the medium of communication through water, I found that the mere current of electricity would occasion a stream of very small bubbles to rise from the extremity of the gold, although the wire, by which it communicated with the positive or negative conductor, was placed in absolute contact with them. Hence it appears, that decomposition of water may take place by common electricity, as well as by the electric pile, although no discernible sparks are produced.

"The appearance of two currents of air may also be imitated, by occasioning the electricity to pass by fine points of communication on both sides of the water: but, in fact, the resemblance is not complete; for, in every way in which I have tried it, I observed that each wire gave both oxygen and hydrogen gas, instead of their being formed separately, as by the electric pile.

"I am inclined to attribute the difference in this respect to the greater intensity with which it is necessary to employ common electricity; for, that positive and negative electricity, so excited, have each the same chemical power as they are observed to have in the electric pile, may be ascertained by other means.

"In the precipitation of copper by silver, an instance of de-oxidation (or phlogistication) by negative electricity has been mentioned; the oxidating power of po-

Theory. fitive electricity may be alſo proved, by its effects on vegetable blue colours.

95 and in changing the blue colour of vegetables.

"*Exper.* 8.—Having coloured a card with a ſtrong infuſion of litmus, I paſſed a current of electric ſparks along it, by means of two fine gold points, touching it at the diſtance of an inch from each other. The effect, as in other caſes, depending on the ſmallneſs of the quantity of water, was moſt diſcernible when the card was nearly dry. In this ſtate a very few turns of the machine were ſufficient to occaſion a redneſs at the poſitive wire, very manifeſt to the naked eye. The negative wire, being afterwards placed on the ſame ſpot, ſoon reſtored it to its original blue colour.

"By Mr Volta's apparatus the ſame effects are produced in a much leſs time.

"Beſides the ſimilarity which has thus been traced between the effects of electricity excited by the common machine, and thoſe obſerved from the electric pile, I think it appears alſo probable, that they originate from the ſame ſource.

"With regard to the latter, its power is known to depend on oxidation; ſo alſo does the excitement in the former appear very much to depend on the ſame proceſs; for,

"*Exper.* 9.—I have found that, by uſing an amalgam of ſilver or of platina, which are not liable to be oxidated, I could obtain no electricity. An amalgam of tin, on the contrary, affords a good degree of excitement. Zinc acts ſtill better; but the beſt amalgam is made with both tin and zinc, a mixture which is more eaſily oxidated than either metal ſeparately.

"*Exper.* 10.—But, as a farther trial whether oxidation aſſiſts in the production of electricity, I mounted a ſmall cylinder, with its cuſhion and conductor, in a veſſel ſo contrived, that I could at pleaſure change the contained air.

"After trying the degree of excitement in common air, I ſubſtituted carbonic acid gas, and found that the excitement was immediately deſtroyed, but that it returned upon re-admiſſion of atmoſpheric air.

"In conformity to this hypotheſis, we find that the metal oxidated is, in each caſe, in a ſimilar ſtate of electricity; for the cuſhion of the machine, by oxidation of the amalgam adhering to it, becomes negative; and in the ſame manner, zinc, oxidated by the accumulated power of an electric pile, or ſimply by action of an acid, is alſo negative.

"This ſimilarity in the means by which both electricity and galvaniſm appear to be excited, in addition to the reſemblance that has been traced between their effects, ſhews that they are both eſſentially the ſame, and confirms an opinion that has already been advanced by others, that all the differences diſcoverable in the effects of the latter, may be owing to its being leſs intenſe, but produced in much larger quantity*."

* *Phil. Tranſ.* 1801. p. 427.

This analogy was ſtill farther eſtabliſhed by the experiments of Van Marum, in which he ſucceeded in charging an electrical battery, conſiſting of 137½ ſquare feet, by means of the galvanic pile. On examining the power of the ſhocks which were given by the battery charged with the pile, it was found that the ſhock from 100 pairs of plates was about equal to a ſhock from the battery, when it was charged by means of 200. A pile of 200 pairs of plates ſeemed to have ſix times the power of an electrical machine, having a plate of 31 inches diameter. Theory.

96 Diſtinguiſhing property between galvaniſm and electricity.

The following experiments made by Mr Cuthbertſon, with galvanic batteries, are ſuppoſed by him to afford a diſtinguiſhing property between the galvanic and electric fluids. 1. Charcoal was deflagrated and ignited for above an inch in length. 2. Iron wire $\frac{1}{40}$ of an inch diameter was melted into a ball of $\frac{1}{10}$ inch diameter. 3. Platina wire $\frac{1}{100}$ inch diameter, was melted into a ball $\frac{1}{10}$ inch diameter. 4. Braſs wire $\frac{1}{20}$ inch diameter, three-fourths of an inch in length was ignited. 5. Braſs wire $\frac{1}{10}$ inch diameter was red hot at the end. 6. Iron wire $\frac{1}{150}$ inch diameter was red hot for 16 inches in length. 7. Iron wire, 12 inches deflagrated, and melted into a ball. 8. Iron wire ſix inches in length was deflagrated. 9. Iron wire eight inches in length was ignited.

The firſt ſeven experiments above were made with two troughs, each containing 30 pairs of plates, ſix inches ſquare, but in the laſt two experiments, one of theſe troughs only was uſed. The concluſion drawn from the four laſt experiments is, that double quantities of galvanic fluid only burn double lengths of wire, and not the ſquare, as electrical diſcharges do*.

* *Phil Mag.* xviii. 358.

To diſcover what quantity of coated glaſs would be required to take a charge ſufficient to ignite the ſame lengths of wire, the two laſt experiments were compared with common electrical diſcharges. Two jars, each containing about 170 ſquare inches of coating, were ſet to the conductor of a 24 inch ſingle-plate electrical machine, with the author's univerſal electrometer, loaded with 31 grains. Eight inches of the ſame kind of wire were laid in the circuit, and with 57 revolutions of the plate the electrometer diſcharged the jars, and the wire was ignited as perfectly as in experiment 9th. Afterwards ſix inches of the wire being laid in the circuit, a diſcharge was produced with the ſame number of revolutions of the machine, and the wire was deflagrated, and fuſed into balls, in the ſame manner as in the 8th experiment. Hence he concluded, that 340 ſquare inches of coated glaſs, properly conſtructed, are ſufficient to bear a charge equal to a galvanic battery of 1080 ſquare inches of ſurface. On comparing the above experiments with ſome others made ſome time before, the author finds it neceſſary to modify the concluſion which he had deduced from them. With a pile of 16 pairs of plates, of 10 inches diameter, eight of which were laid upon each other in the uſual manner, and cloths moiſtened with diluted muriatic acid interpoſed, he burnt half an inch of wire of $\frac{1}{103}$ inch diameter; and when the other eight pairs were added, he burnt four inches of the ſame wire. This was repeated with the eight in pairs with the ſame reſult, with reſpect to the burning of metals, but it gave ſtrong and loud ſparks from metal to metal, which might be heard at the diſtance of 300 yards. This reſult, he obſerves, had not been attained from troughs, to be heard at any diſtance. In the laſt experiment the cloths were moiſtened with a ſtrong ſolution of muriate of ammonia. Comparing this effect of the pile and the trough, Mr Cuthbertſon thinks, there is ſome defect in the arrangement or conſtruction of the latter.

In many experiments which Volta made on piles compoſed of a ſingle metal, and a ſingle wet ſtratum, which

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which of themſelves are inactive, it was found that they became more or leſs active, after affording a paſſage for a longer or ſhorter time to an electric current, which was ſet in motion by an active pile. According to Ritter, the active pile or common electrometer tranſmits a real charge to the pile, which is itſelf inactive, and this he calls the *charged pile*. Volta, however, is of opinion, that no charge is tranſmitted but by means of the ordinary chemical action; for the electrical current being continued, changes the ſingle wet ſtratum interpoſed between two pieces of gold, for example, into two different fluids; one acid, by which the electric current iſſues out of the metal, and the other alkaline, by which it enters, thus conſtituting a pile of the ſecond order, compoſed of one metal, and two fluids of different natures. The action of this pile, however, ſoon ceaſes, becauſe the fluids ſoon mix together *.

* *Nichol. Journ.* xi. 144.

CHAP. III. *Of the Formation of Muriatic Acid and Soda, by means of Galvaniſm.*

SOME of the moſt curious phenomena which have yet been exhibited in galvaniſm, relate to the formation of muriatic acid by means of this power. In the account which has been given of Mr Cruickſhank's experiments, it will be recollected that he made the diſcovery of the formation of an acid and alkali, during the action of the galvanic battery. This acid, he concluded, was the nitric, and the alkali, ammonia. The theory of the production of theſe ſubſtances in the galvanic pile has been already mentioned, and it correſponds with the explanation of the principles which have been adopted for explaining the phenomena of galvaniſm; later reſearches, however, have been conducted with more accurate obſervation, or have opened a wider field of diſcovery. The truth of this remark will be fully confirmed, if it be at laſt finally aſcertained, that common ſalt, the component parts of which are muriatic acid and ſoda, is produced by the action of galvaniſm.

The firſt hint of this diſcovery was given by Mr Peel of Cambridge, in a letter dated April 1805, addreſſed to the editor of the Philoſophical Magazine †, of which the following account is given in his own words. "I took (ſays he), about a pint of diſtilled water, and decompoſed one half of it by means of galvaniſm; the other half I evaporated, and I found to remain at the bottom of the glaſs a ſmall quantity of ſalt, which upon examination I found to be muriate of ſoda, or common ſalt.—What induced me to try the experiment was this; I knew that when water was decompoſed by means of galvaniſm, the water near one of the wires had alkaline, while that near the other had acid properties. This being the caſe, I inferred, that if an alkali and an acid were really produced, I ſhould, by decompoſing a large quantity of water, obtain a ſmall quantity of ſome kind of neutral ſalt: as was actually the caſe on trying the experiment. The ſalt could not have been contained in the water before I made the experiment, becauſe I uſed every precaution to have it free from impurities. I even took the trouble to repeat the experiment, though a tedious one, and I again obtained the ſame reſult." He adds, that a ſimilar experiment being repeated by a friend of his, afforded a ſimilar reſult.

† Vol. xxi. p. 279. 67

Mr Peel's diſcovery of the formation of muriate of ſoda.

It having been ſuggeſted to Mr Peel, that it might be worth while to vary the experiment, by employing water formed of its elements, he gives the following account of the reſult of this proceſs, in another letter, dated June 1805.

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"Having proceeded, he obſerves, to the formation of water from its elements, with which to repeat my former experiment, I found when the oxygen and hydrogen gaſes were quite pure, and exactly in due proportion, that no reſiduum of air was left, and that the water formed was not in the ſlighteſt degree acidulous. When the proceſs was not conducted with great accuracy, or any precaution to have it accurate was omitted, I then found the water acidulous, and the acid that cauſed this acidity to be the nitric acid.

"The acidulous water thus obtained I neutralized with lime, from which I diſtilled the water, and this water I decompoſed by the galvanic proceſs, as in the experiment detailed in my former letter.

"I did not imagine the uſing water ſo obtained could make the leaſt difference on the reſult of the experiment; but as a wiſh was expreſſed to have the trial made, I again undertook that intereſting but very tedious labour.

"When I came to examine the reſiduum, to my great aſtoniſhment I found that not muriate of ſoda, but muriate of potaſh, was produced. I muſt own I feel myſelf entirely at a loſs how to account for this, nor ſhall I attempt it; all I can ſay is, that this, as well as my former experiment, was conducted with the greateſt care and accuracy that I could beſtow *."

* *Phil. Mag.* xxii. 153. 68

About the ſame time a diſcovery of a ſimilar nature was made by Profeſſor Pacchiani of Piſa. This diſcovery, which relates to the compoſition of muriatic acid, was firſt announced in this country in the number of the Edinburgh Medical and Surgical Journal, publiſhed the 1ſt July 1805. The following is an account of his experiments, and the concluſions which he deduces from them in his own words. "The ſimplicity of the apparatus, (he ſays), and of the means adopted to attain my views, the care with which I endeavoured to avoid every ſource of error, have, I hope, ſufficiently ſecured me againſt thoſe illuſions which frequently deceive young men ardent in the purſuit of ſcience, and even thoſe practiſed in the art of extorting from nature her ſecrets. Want of time prevents me from relating the ſeries of experiments by which I arrived at the diſcovery I have mentioned; but you may ſee it by peruſing the manuſcript of my memoir, which will be immediately publiſhed, to ſubmit my reſearches and their reſults to the judgment of the learned. For the preſent, I ſhall ſelect from the experiments and facts therein deſcribed thoſe which are deciſive, and which eſtabliſh, in an evident manner, the following truths:—

Pacchiani's diſcovery of muriatic acid.

"I. Muriatic acid is an oxide of hydrogen, and conſequently compoſed of hydrogen and oxygen.

"II. In the oxygenated muriatic acid, and therefore, *à fortiori*, in muriatic acid, there is a much leſs proportion of oxygen than in water.

"III. Hydrogen is ſuſceptible of very many and different degrees of oxidation, contrary to what is univerſally believed by pneumatic chemiſts, who aſſert that hydrogen is ſuſceptible only of one invariable degree of oxidation, that in which it forms water.

"Having at firſt examined the phenomenon of the decompoſition of water by the galvanic pile, and having, by accurate experiments, aſcertained the true theory,

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theory, I readily discovered a very simple and exact apparatus, in which I could distinctly perceive the changes which happen to water, which, from the continued action of the galvanic pile, is continually losing its oxygen at the surface of a wire of very pure gold immersed in it.

" I therefore proceeded to examine these gradual changes of water thus losing its oxygen; and I at last observed a very singular fact, which unequivocally indicated the formation of an acid. In other antecedent experiments I had examined the nature of the air obtained before arriving at this remarkable point, and I always found, by means of the eudiometer of Giobert, that it was very pure oxygen, as the residuum scarcely amounted to one-fixtieth.

" Having thus examined the nature of the air formed in various experiments, from the first moment of decomposition, until there were evident indications of the formation of an acid, I began to endeavour to determine, in a more positive manner, the existence and nature of this acid.

" When the water, or, to speak more accurately, the residual fluid, occupied about half the capacity of the receiver, which at first contained the water, this residual fluid presented the following characters:

" Its colour was an orange yellow, more or less deep, according as the bulk of the residual liquor was greater or less, and it resembled in appearance a true solution of gold.

" From the inferior orifice of the vessel, which was closed with a piece of taffety, and then with double bladder, there escaped a smell which was easily recognized to be that of oxygenated muriatic acid.

" The gold wire had in part lost its metallic lustre, and its surface appeared as if corroded by a solvent.

" The bit of taffety which had been in contact with the coloured fluid, in consequence of its action, was easily torn, as is usual with similar bodies when half burnt (*semi-combusto*).

" Around the edges of the vessel, on the bladder, there was formed a deep purple ring, which surrounded a circular space rendered entirely colourless, or white.

" A drop of this fluid tinged the skin of the hand, after some hours, with a beautiful rose colour.

" Having obtained, in various successive experiments, the same liquid, possessing constantly the same properties, I chose that obtained in the last experiment to subject it to chemical examination. The very able chemist of this university, Signior Giuseppe Branchi, had the goodness to enter zealously into my views; and in his laboratory we easily proved,

" 1. The existence of a volatile acid, by the white vapours which were formed by ammonia placed near it.

" 2. That this acid was certainly oxygenated muriatic acid, since it formed in nitrate of silver a curdy precipitate, the luna cornea of the antients or the muriate of silver of the moderns. From these facts we may draw the following positive and undeniable results:

" 1. Muriatic acid is an oxide of hydrogen, and is therefore composed of hydrogen and oxygen.

" 2. Oxygenated muriatic acid, and of course muriatic acid, contains less oxygen than water does.

" 3. Hydrogen has not one degree of oxygenation, but many. One of these constitutes water, another below it oxygenated muriatic acid, and, below this, there is another which constitutes muriatic acid."

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69 Henry's remarks.

Mr Henry of Manchester, in an account of his investigations on this subject, observes that there is a considerable point of difference between the English and the Italian chemist. The result of Mr Peel's experiment was found to be muriate of soda; but in Professor Pacchiani's, in which an interrupted gold wire was employed, it appeared to be muriate of gold. This ingenious chemist, with the same view, made the following experiment. He took a glass tube $4\frac{1}{2}$ inches long, .35 inches diameter, in which were secured with corks, two slips of platina, having their extremities at a proper distance to effect the decomposition of the water. The quantity of water, at the beginning of the experiment, amounted to two drams. After being exposed to the galvanic action for six days, it was so far diminished, that $\frac{1}{2}$ inch of the tube was unfilled. The water which was employed was carefully purified, by being first distilled, and then, after adding nitrate of silver, by a second distillation. After the experiment was finished, with the addition of nitrate of silver, it became opalescent in a few seconds, and being exposed to the light, exhibited those changes which indicate the presence of muriatic acid. It did not appear that muriate of platina had been produced, for muriate of ammonia being added to one portion, and carbonate of soda to another, produced no precipitation.

In making this experiment, Mr Henry suggests a very useful precaution. The water employed, he observes, should never, on any account, come into contact with the fingers, because there is a constant excretion of muriate of soda from the skin, and in this way the purest water is very soon contaminated. He recommends also, that glass stoppers should be employed in place of corks, for transmitting the conducting wires *.

* *Ibid.* 183.

70 New experiments by Mr Peel

In another communication by Mr Peel on the same subject, he relates the following experiments, which were undertaken, he says,

" 1st, To determine whether the difference in the result of the before-mentioned experiments was owing in any degree to my having employed lime to neutralize the water employed in my second experiment, before it was distilled.

" 2d, To ascertain whether the salts found in the residual water, or any component part of them, came from the galvanic battery by means of the wires.

" To determine the first point, I varied my experiment by employing for decomposition water distilled under different circumstances.

" *Exper.* 1.—The water employed in this experiment was distilled from water containing lime. A portion of it was decomposed in the manner that has before been stated. The remaining water yielded muriate of potash

" *Exper.* 2 —Water distilled from water containing magnesia was decomposed in the same manner. The result was muriate of soda.

" *Exper.* 3 —In this experiment double distilled snow water was employed. The result was muriate of soda.

" *Exper.*

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"*Exper.* 4.—Water distilled from barytes was now used. The result was still muriate of soda.

"The water which I used in the experiment detailed in my first letter was distilled from pump water (the pump is on the premises where I live), which I have not myself analyzed, but a friend has been so good as to take upon him that trouble. He has not been able to detect in it the minutest portion of magnesia. In one of the above experiments, having used water distilled from magnesia, I obtained muriate of soda; but, having obtained the same result from distilled snow water, and from water distilled from barytes, I conclude that the production of the soda has nothing to do with the presence of magnesia.

"But, in the production of potash, the presence of lime seems to be essential, and, as you hinted, a portion of lime must have been carried over with the distilled water, a fact which few would suspect, and which probably may often be the cause of differences in the results of chemical investigations, conducted, to all appearance, in a similar manner.

"To determine the second point which I had in view, namely, whether the salts found in the residual water, or any component part of them, came from the galvanic battery by means of the conducting wires, I made similar experiments to those before stated, employing for the decomposition of the distilled water a powerful electrical machine instead of a galvanic battery, but without obtaining results different from what have been already stated *."

Ibid. xxiii. 58.

71 and others.

It is stated in the same number of the Philosophical Magazine, that the following result was obtained in an experiment on the same subject. By continuing to pass the galvanic fluid from a trough composed of 40 pairs of square inch plates, through distilled water, contained in a glass tube, the tube being furnished at one end with a wire of gold, and at the other with a wire of platina, it was found that a coating of oxide of gold was deposited on the gold wire, from which it is concluded, that oxymuriatic acid was found in the process †. A more particular account was afterwards given by the author of this experiment, and of the precautions he observed in repeating it. He took a clean glass tube, which was bent as in the former experiment; but, instead of the gold wire, he employed one of platina, so that both wires were of the same metal. One of the wires was only introduced a short way into the tube containing the distilled water; the other wire introduced at the other extremity, passed nearly through its whole length, till it reached beyond the point at which the short wire terminated. After the apparatus had stood for three days, with the zinc end of the trough connected with the short platina wire, the latter assumed the colour of gold, and the long one became black from the lower end to the height of the short wire, and continued so for the space of three weeks. The water being diminished one-third, the short wire was connected with the copper end of the trough, and in one day's time the long wire became bright, and the short one black. After two days had elapsed, that part of the long wire which reached to the height of the short one, assumed a yellowish golden tinge. Both the wires remained so for three days, when they were placed in their first situation. The black powder then left the short wire, and the long one became black. A slip of blue test paper being immersed in the remaining water, its colour was changed, which indicates the production of an acid.

p. 185.

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Pacchiani, the discoverer, in another letter on this subject addressed to Fabroni, seems to think that those who have failed in obtaining the same results in the decomposition of water, have either been influenced in conducting their experiments by preconceived opinions, or have deviated from the process which he followed. But for an account of his views and reasonings, see *An. de Chim.* tom. lvi. or Phil. Mag. xxiv. 176. We shall only observe, that he still considers himself warranted to draw the same conclusion with regard to the formation of the acid, by the action of galvanism.

Mr Sylvester of Sheffield made the following experiment on this subject. The water which he employed was not changed by adding nitrate of silver. This water was introduced into a tube which was secured at one end with a bit of bladder. At the other end was a cork, through which a wire of platina was passed, nearly to the bottom of the tube. The tube was then set in a wine glass, containing also pure water, and into this was also introduced another wire of platina, the extremity of which came under the end of the tube, and as near as possible to the bladder. The wire within the tube was connected with the zinc end of the trough, and the wire in the glass, which was in contact with the bladder, proceeded from the copper end. After the process had continued for an hour, the liquid in the tube was put to the test of nitrate of silver, and when a sufficient precipitate was obtained, to ascertain the presence of muriatic acid, the liquid in the glass contained an alkali, which the author suspected was ammonia *.

* *Nichol. Journal.* xiv. 97.

Brugnatelli observes, that, after having galvanised several times, both negatively and positively, a certain quantity of pure water with golden wires, inserted in separate tubes, till he found, by the usual tests, that acid was produced on the one part, and alkali on the other, when the two liquids were mixed to perfect saturation, and evaporated in the air, he always obtained muriate of soda crystallized in cubes. He has therefore no doubt, that water negatively and positively galvanised, by means of gold wires, produces or disengages muriatic acid in the one case, and soda in the other †.

† *Phil. Mag.* xxv. 66.

Such are the authorities for this curious phenomenon which we have hitherto had an opportunity of consulting; but although in general it would appear that the experiments made with the view of ascertaining the truth of the discovery announced by Pacchiani, have most generally succeeded, some other experiments, made with the same view, have failed. For this purpose a series of experiments was instituted by the Galvanic Society of Paris, whose attention was directed to endeavour, as well by means of electricity as of galvanism, to confirm this important discovery; but although they employed a very simple apparatus, and one which seemed least susceptible of any foreign influence, they do not think it possible to produce any thing by the action of the galvanic pile, except the decomposition of a greater or less proportion of the water submitted to its action. The water remaining in the tube being carefully examined, produced no effect on the tinctures of turnsole or brazil wood, or the solution of nitrate of silver.

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ſilver. Hence it is concluded that neither muriatic acid nor ſoda was formed in this experiment.

Some other experiments made with the ſame view have alſo failed; but according to De Buch, certain precautions ſeem to be neceſſary in conducting this experiment, which, if overlooked, it cannot be expected, he thinks, to be followed with ſucceſs. For the particulars of theſe, ſee Phil. Mag. xxiv. 244. For an account of the analogy between the peculiarity of ſtructure of the torpedo, by which it is enabled to give electric ſhocks, and the galvanic battery, ſee TORPEDO; and for a full detail of the chemical effects of Galvaniſm, ſee ZINC.

THE following facts, which ſeem to extend the analogy of galvaniſm with electricity on the one hand, and with magnetiſm on the other, were omitted in the preceding treatiſe.

Ritter, one of the moſt indefatigable philoſophers, in proſecuting experiments and inquiries on this ſubject, has ſucceeded in charging a piece of money with the galvanic fluid, and with this ſome of the phenomena of galvaniſm can be exhibited. To effect this, he places a louis d'or between two pieces of paſteboard, thoroughly wetted, and keeps it for ſix or eight minutes in the chain of circulation connected with the pile. In this way the louis becomes charged, without being immediately in contact with the conducting wires. If this louis be afterwards applied to the crural nerves of a frog, recently prepared, the uſual contractions will be produced. It is found that the charge is retained, in proportion to the time that the piece has remained in the circuit of the pile. Some have retained it for five minutes. Ritter has alſo diſcovered, that the piece of gold thus galvaniſed, exerts at once the action of two metals; the half next the negative pole, while in the circle, became poſitive, and the half towards the poſitive pole became negative. He alſo tried the effect of golden needles charged with galvaniſm, and balanced on a pivot, and he perceived, to his ſurpriſe, that theſe needles had a certain dip and variation;—that the angle of variation was uniformly the ſame, differing, however, from that of the magnetic needle, and that the poſitive pole always dips *.

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* *Nichol. Journal*, xii. 99.

If the facts which the above experiments ſeem to prove, ſhould be fully aſcertained, there is an obvious analogy, not only between electricity and galvaniſm, but alſo between the latter and magnetiſm.

A galvanic pile has been conſtructed by Dr Baronio of Milan, entirely of vegetable matters. For this purpoſe he cut diſcs of horſe radiſh and beet root, of two inches in diameter. He then prepared equal diſcs of walnut tree wood; the latter diſcs were raiſed at their edges, to contain a little ſolution of acidulous tartrate of potaſh in vinegar, in which they had been previouſly boiled to free the wood from roſin. Sixty pairs of diſcs were employed in the following order; viz. horſe radiſh, beet-root, diſcs of wood, in each of which the ſolution was put. The ſpinal marrow of a prepared frog was connected with the pile, by means of a leaf of *cochlearia*; the muſcles of the frog were connected with the top of the pile by means of a double band of gray paper wetted with vinegar, and as often as this circuit was completed, contractions were excited in the animal.

GAL

Galway.

GALWAY, or GALLOWAY, a county of Ireland, which is 76 miles in length, and 40 in breadth, bounded by the counties of Clare, Tipperary, King's County, Roſcommon, and the ſea. The river Shannon waſhes the frontiers of the eaſt and ſouth-eaſt, and forms a lake ſeveral miles in length. This county contains 28,212 houſes, and the number of inhabitants is eſtimated at 142,000. This county ſends two members to the Imperial parliament. The capital town is of the ſame name.

GALWAY, a town of Ireland, in the county of the ſame name, and province of Connaught, of which it is the capital. It is ſeated on the bay of Galway on the weſtern ocean, 96 miles weſt of Dublin, and in W. Long. 8. 58. N. Lat. 53. 15. It is ſurrounded with ſtrong walls, and the houſes, which are well built, amount to 950, with 12,000 inhabitants. It has a good trade into foreign parts, on account of its harbour, which is defended by a fort. It is governed by a mayor, ſheriffs, and recorder. It has but one pariſh church, which is a large and beautiful Gothic ſtructure, an exchange, barracks for 10 companies of foot, a charter ſchool, and an hoſpital. This was one of the ſtrongeſt towns in the kingdom; it held out ſome time againſt General Ginkle, who inveſted and took it after the battle of Aughrim. Its fortifications were then repaired. The walls are flanked by baſtions, but are moſtly gone to decay. The ſalmon and herring fiſheries are carried on here with great ſpirit, and employ 700 boats; the quantity

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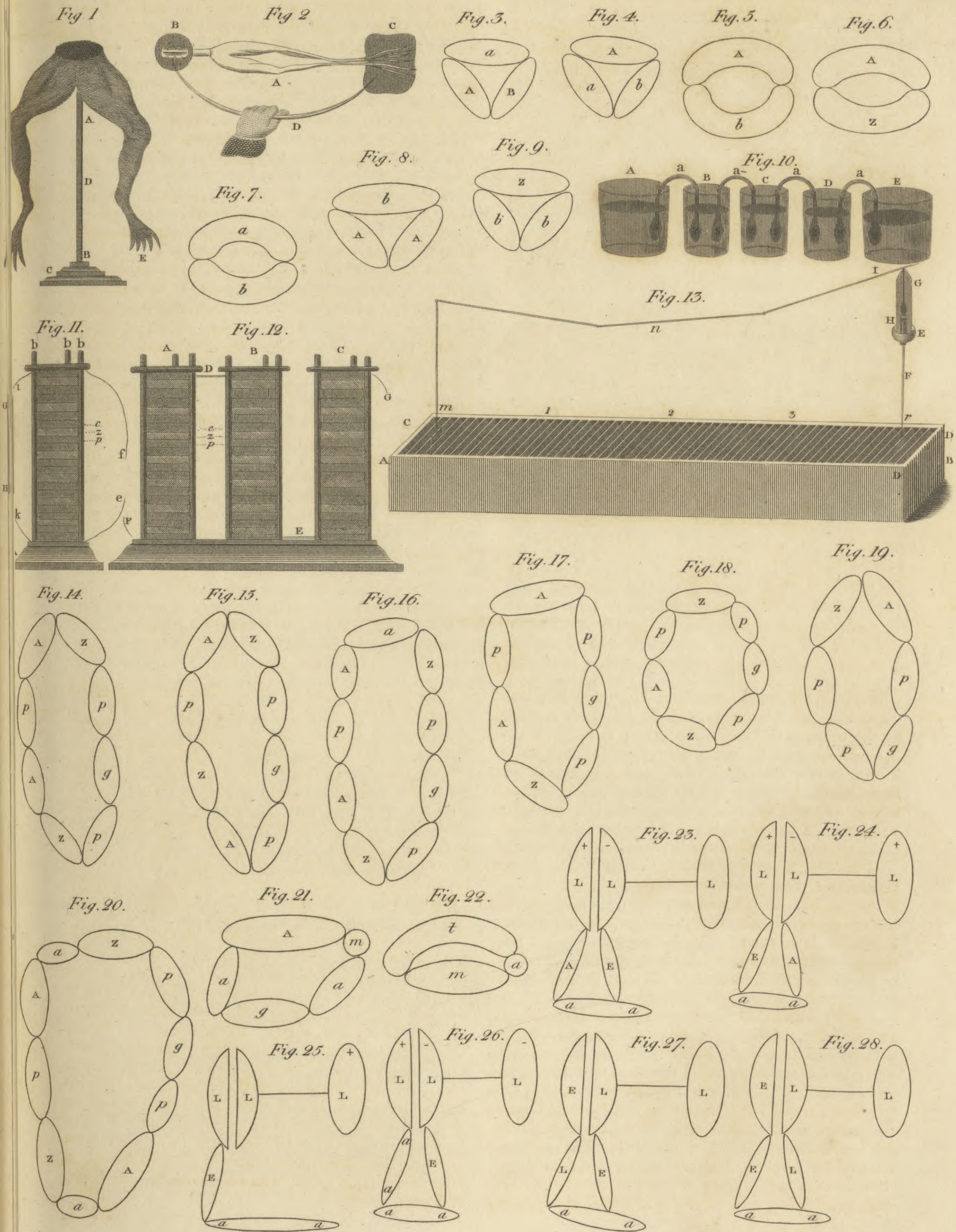
Galway.

of kelp manufactured and exported is conſiderable; and the growth of the linen manufacture, though of late introduction, is become very important. In 1296, Sir William de Burgh founded a monaſtery here for Franciſcan friars, on St Stephen's iſland, ſituated without the north gate of the town. In 1381, there being two popes at Rome, and the people of Ireland being doubtful to which they ſhould pay obedience, Pope Urban, to fix them entirely to his intereſt, empowered the guardian of this monaſtery to excommunicate every perſon in the province of Connaught who ſhould adhere to his rival Clement VII. who he aſſured them was antipope.—Near the weſt gate of the town, without the walls, was the monaſtery of St Mary of the Hill: on the nuns forſaking it, the ſecular clergy entered into and kept poſſeſſion of it for a conſiderable time; but on the petition of the inhabitants of the town to Pope Innocent VIII. it was granted to the Dominican friars, by a bull dated the 4th December 1488. There are no remains of this foundation except the cemetery; the whole building having been demoliſhed by the townſmen in the year 1652, in order to prevent Cromwell from turning it into a fortification againſt themſelves: there was alſo an Auguſtinian friary, on a hill near this town, founded by Stephen Lynch, and Margaret his wife, in the year 1508, at the earneſt ſolicitation of Richard Nangle, a friar of the ſame order, who afterwards became biſhop of Tuam.



E. Mitchell sculp.t

Gama || Game.

GAMA, VASCO or VASQUES DE, a celebrated navigator, was born at Sines, a ſea-port town in the province of Alentejo, in Portugal. When King Emanuel reſolved to extend the diſcoveries formerly made of the ſouthern parts of Africa, and the ſeas lying between theſe and the Eaſt Indies, the well-known prudence and courage of De Gama pointed him out as a proper perſon to conduct ſuch an enterpriſe. He ſailed from Liſbon in the month of July 1497, with no more formidable a ſquadron than three ſmall armed veſſels and a ſtore ſhip, with which he did not reach the Cape of Good Hope till the end of four months, owing to violent and contrary winds. He doubled this promontory, and afterwards coaſted along the ſouth-eaſt ſide of Africa, till he reached Melinda, having touched at different ports on his way. At this place he procured a Mahometan pilot, by whom he was conducted in ſafety to the coaſt of Malabar, and he reached Calicut in the month of May. The prince at firſt received him in a hoſpitable manner, but a plot being at length laid for his deſtruction by the Mahometan merchants, he made the beſt of his way to Europe as ſoon as he diſcovered it. He arrived at Liſbon in September 1499, with the loſs of the majority of his crew, ariſing from fatigue and diſeaſe. Having ſpent ſome time in devotion at a hermitage, he made a ſplendid entrance into the city, and beſides pecuniary rewards, was honoured by the king with the title of count of Videgueira. By this voyage the practicability of a new paſſage to the Indies was fully eſtabliſhed. De Gama undertook a ſecond voyage, with the title of admiral of the Indian, Perſian, and Arabian ſeas, having 20 ſail of ſhips under his command. This voyage began in February 1502, and after compelling ſeveral princes in his route to pay tribute to him, he arrived at Cochin, where a deputation from the Chriſtians of St Thomas, to whom he promiſed protection, waited upon him. The Zamorin being extremely ſuſpicious of theſe new viſitors, fitted out a fleet, but De Gama anticipated the deſign, and began the attack, making a prize of two large veſſels of prodigious value. He left a ſquadron at Canonor after this victory, and ſailed for Liſbon, at which place he arrived in the month of September 1503. On the acceſſion of John III. to the throne, De Gama, then very far advanced in years, was prevailed upon to undertake a third voyage, with the exalted rank of viceroy of the Indies. He conquered the people of Calicut in a naval engagement, and died at Cochin in the year 1525.

GAMBIA, a large river of Negroland in Africa, running from eaſt to weſt to the Atlantic ocean; it is ſuppoſed to be a branch of the Niger.

GAMBOGE is a concreted vegetable juice, partly of a gummy and partly of a reſinous nature, chiefly brought in large cakes or rolls from Cambaja in the Eaſt Indies. See CHEMISTRY and MATERIA MEDICA *Index*.

GAME, in general, ſignifies any diverſion or ſport, that is performed with regularity, and conducted by certain rules. See GAMING.

Games are uſually diſtinguiſhed into thoſe of exerciſe and addreſs, and thoſe of hazard. To the firſt belong cheſs, tennis, billiards, &c. and to the latter thoſe performed with cards, or dice, as back-gammon, ombre, piquet, whiſt, &c. See *BACK-Gammon*, &c. Game.

GAMES, in antiquity, were public diverſions, exhibited on ſolemn occaſions. Such among the Greeks were the Olympic, Pythian, Iſthmian, Nemean, &c. games; and, among the Romans, the Apollinarian, Circenſian, Capitoline, &c. games. See OLYMPIC, PYTHIAN, FUNERAL, &c.

GAME, in *Law*, ſignifies birds, or prey, taken or killed by fowling or hunting.

The property of ſuch animals *feræ naturæ* as are known under the denomination of *game*, with the right of purſuing, taking, and deſtroying them, is veſted in the king alone, and from him derived to ſuch of his ſubjects as have received the grants of a chaſe, a park, or a free warren.

By the law of nature, indeed, every man, from the prince to the peaſant, has an equal right of purſuing, and taking to his own uſe, all ſuch creatures as are *feræ naturæ*, and therefore the property of nobody, but liable to be ſeized by the firſt occupant. But it follows from the very end and conſtitution of ſociety, that this natural right, as well as many others belonging to man as an individual, may be reſtrained by poſitive laws enacted for reaſons of ſtate, or for the ſuppoſed benefit of the community. This reſtriction may be either with reſpect to the *place* in which this right may, or may not, be exerciſed; with reſpect to the *animals* that are the ſubjects of this right; or with reſpect to the *perſons* allowed or forbidden to exerciſe it. And, in conſequence of this authority, we find that the municipal laws of many nations have exerted ſuch power of reſtraint; have in general forbidden the entering on another man's grounds, for any cauſe, without the owner's leave; have extended their protection to ſuch particular animals as are uſually the objects of purſuit; and have inveſted the prerogative of hunting and taking ſuch animals in the ſovereign of the ſtate only, and ſuch as he ſhall authoriſe. Many reaſons have concurred for making theſe conſtitutions: as, 1. For the encouragement of agriculture and improvement of lands, by giving every man an excluſive dominion over his own ſoil. 2. For the preſervation of the ſeveral ſpecies of theſe animals, which would ſoon be extirpated by a general liberty. 3. For prevention of idleneſs and diſſipation in huſbandmen, artificers, and others of lower rank; which would be the unavoidable conſequence of univerſal licenſe. 4. For prevention of popular inſurrections and reſiſtance to the government, by diſarming the bulk of the people: which laſt is a reaſon oftener meant than avowed, by the makers of foreſt or game laws. Nor certainly, in theſe prohibitions is there any *natural* injuſtice, as ſome have weakly enough ſuppoſed: ſince, as Puffendorf obſerves, the law does not hereby take from any man his preſent property, or what was already his own; but barely abridges him of one means of acquiring a future property, that of occupancy; which indeed the law of nature would allow him, but of which the laws of ſociety have in moſt inſtances very juſtly and reaſonably deprived him.

Yet, however defenſible theſe proviſions in general may be, on the footing of reaſon, or juſtice, or civil policy, we muſt, notwithſtanding, acknowledge, that,

Game. in their preſent ſhape, they owe their immediate original to ſlavery. It is not till after the irruption of the northern nations into the Roman empire, that we read of any other prohibitions, than that natural one of not ſporting on any private grounds without the owner's leave.

With regard to the riſe and original of our preſent civil prohibitions, it will be found, that all foreſt and game laws were introduced into Europe at the ſame time, and by the ſame policy, as gave birth to the feodal ſyſtem: when thoſe ſwarms of barbarians iſſued from their northern hive, and laid the foundation of moſt of the preſent kingdoms of Europe, on the ruins of the weſtern empire. For when a conquering general came to ſettle the economy of a vanquiſhed country, and to part it out among his ſoldiers or feudatories, who were to render him military ſervice for ſuch donations; it behoved him, in order to ſecure his new acquiſitions, to keep the *ruſtici* or natives of the country, and all who were not his military tenants, in as low a condition as poſſible, and eſpecially to prohibit them the uſe of arms. Nothing could do this more effectually than a prohibition of hunting and ſporting: and therefore it was the policy of the conqueror to reſerve this right to himſelf, and ſuch on whom he ſhould beſtow it; which were only his capital feudatories, or greater barons. And, accordingly, we find, in the feudal conſtitutions, one and the ſame law prohibiting the *ruſtici* in general from carrying arms, and alſo proſcribing the uſe of nets, ſnares, or other engines for deſtroying the game. This excluſive privilege well ſuited the martial genius of the conquering troops, who delighted in a ſport which in its purſuit and ſlaughter bore ſome reſemblance to war. *Vita omnis* (ſays Cæſar, ſpeaking of the ancient Germans) *in venationibus atque in ſtudiis rei militaris conſiſtit.* And Tacitus in like manner obſerves, that *quoties bella non incunt, multum venatibus, plus per otium tranſigunt.* And indeed, like ſome of their modern ſucceſſors, they had no other amuſement to entertain their vacant hours; for they deſpiſed all arts as effeminate, and had no other learning than what was couched in ſuch rude ditties as were ſung at the ſolemn carouſals which ſucceeded theſe ancient huntings. And it is remarkable, that, in thoſe nations where the feodal policy remains the moſt uncorrupted, the foreſt or game laws continue in their higheſt rigour. Formerly in France, all game was properly the king's; and in ſome parts of Germany it is death for a peaſant to be found hunting in the woods of the nobility.

With us, in Britain, alſo hunting has ever been eſteemed a moſt princely diverſion and exerciſe. The whole iſland was repleniſhed with all ſorts of game in the time of the Britons; who lived in a wild and paſtoral manner, without encloſing or improving their grounds; and derived much of their ſubſiſtence from the chaſe, which they all enjoyed in common. But when huſbandry took place under the Saxon government, and lands began to be cultivated, improved, and encloſed, the beaſts naturally fled into the woody and deſert tracts, which were called the *foreſts;* and, having never been diſpoſed of in the firſt diſtribution of lands, were therefore held to belong to the crown. Theſe were filled with great plenty of game, which our royal ſportſmen reſerved for their own diverſion, on pain of a pecuniary forfeiture for ſuch as interfered with their ſovereign. But every freeholder had the full liberty of ſporting upon his territories, provided he abſtained from the king's foreſts. Game.

However, upon the Norman conqueſt, a new doctrine took place; and the right of purſuing and taking all beaſts of chaſe or *venary*, and ſuch other animals as were accounted *game*, was then held to belong to the king, or to ſuch only as were authoriſed under him. And this, as well upon the principles of the feodal law, that the king is the ultimate proprietor of all the lands in the kingdom, they being all held of him as the chief lord, or lord paramount of the fee; and that therefore he has the right of the univerſal ſoil, to enter thereon, and to chaſe and take ſuch creatures at his pleaſure: as alſo upon another maxim of the common law, that theſe animals are *bona vacantia*, and, having no other owner, belong to the king by his prerogative. As therefore the former reaſon was held to veſt in the king a *right* to purſue and take them anywhere, the latter was ſuppoſed to give the king, and ſuch as he ſhould authoriſe, a *ſole* and *excluſive* right.

This right, thus newly veſted in the crown, was exerted with the utmoſt rigour, at and after the time of the Norman eſtabliſhment; not only in the ancient foreſts, but in the new ones which the Conqueror made, by laying together vaſt tracts of country, depopulated for that purpoſe, and reſerved ſolely for the king's royal diverſion; in which were exerciſed the moſt horrid tyrannies and oppreſſions, under colour of foreſt law, for the ſake of preſerving the beaſts of chaſe; to kill any of which, within the limits of the foreſt, was as penal as the death of a man. And, according to the ſame principle, King John laid a total interdict upon the *winged* as well as the *four-footed* creation; *capturam avium per totam Angliam interdixit**. The cruel and inſupportable hardſhips which theſe foreſt laws created to the ſubject, occaſioned our anceſtors to be as zealous for their reformation, as for the relaxation of the feodal rigours and the other exactions introduced by the Norman family: and accordingly we find the immunities of *charta de foreſta* as warmly contended for, and extorted from the king with as much difficulty, as thoſe of *magna charta* itſelf. By this charter, confirmed in parliament †, many foreſts were diſafforeſted, or ſtripped of their oppreſſive privileges, and regulations were made in the regimen of ſuch as remained; particularly killing the king's deer was made no longer a capital offence, but only puniſhed by a fine, impriſonment, or abjuration of the realm. And by a variety of ſubſequent ſtatutes, together with the long acquieſcence of the crown without exerting the foreſt laws, this prerogative is now become no longer a grievance to the ſubject.

* *M. Paris*, 303.

† 9 Hen. III.

But as the king reſerved to himſelf the *foreſt* for his own excluſive diverſion, ſo he granted out from time to time other tracts of lands to his ſubjects under the names of *chaſes* or *parks;* or gave them licenſe to make ſuch in their own grounds; which indeed are ſmaller foreſts in the hands of a ſubject, but not governed by the foreſt laws; and by the common law no perſon is

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Game. at liberty to take or kill any beaſts of chaſe, but ſuch as have an ancient chaſe or park; unleſs they be alſo beaſts of prey.

As to all inferior ſpecies of games called *beaſts and fowls of warren;* the liberty of taking or killing them is another franchiſe or royalty, derived likewiſe from the crown, and called *free warren;* a word which ſignifies preſervation or cuſtody: as the excluſive liberty of taking and killing fiſh in a public ſtream or river is called a *free fiſhery;* of which, however, no new franchiſe can at preſent be granted by the expreſs proviſion of *magna charta*, c. 16. The principal intention of granting a man theſe franchiſes or liberties was in order to protect the game, by giving him a ſole and excluſive power of killing it himſelf, provided he prevented other perſons. And no man but he who has a chaſe or free warren, by grant from the crown, or preſcription, which ſuppoſes one, can juſtify hunting or ſporting upon another man's ſoil; nor indeed, in thorough ſtrictneſs of common law, either hunting or ſporting at all.

However novel this doctrine may ſeem, it is a regular conſequence from what has been before delivered, that the ſole right of taking and deſtroying game belongs excluſively to the king. This appears, as well from the hiſtorical deduction here made, as becauſe he may grant to his ſubjects an excluſive right of taking them; which he could not do, unleſs ſuch a right was firſt inherent in himſelf. And hence it will follow, that no perſon whatever, but he who has ſuch derivative right from the crown, is by common law entitled to take or kill any beaſt of chaſe, or other game whatſoever. It is true, that by the acquieſcence of the crown, the frequent grants of free warren in ancient times, and the introduction of new penalties of late by certain ſtatutes for preſerving the game, this excluſive prerogative of the king is little known or conſidered; every man that is exempted from theſe modern penalties looking upon himſelf as at liberty to do what he pleaſes with the game; whereas the contrary is ſtrictly true, that no man however well *qualified* he may vulgarly be eſteemed, has a right to encroach on the royal prerogative by the killing of game, unleſs he can ſhew a particular grant of free warren; or a preſcription which preſumes a grant; or ſome authority under an act of parliament. As for the latter; there are but two inſtances wherein an expreſs permiſſion to kill game was ever given by ſtatute: the one by 1 Jac. I. c. 27. altered by Jac. I. c. 12. and virtually repealed by 22 and 23 Car. II. c. 25. which gave authority, ſo long as they remained in force, to the owners of free warren, to lords of manors, and to all freeholders having 40l. per annum in lands of inheritance, or 80l. for life or lives, or 400l. perſonal eſtate (and their ſervants), to take partridges and pheaſants, upon their own, or their maſter's free warren, inheritance, or freehold: the other by 5 Ann. c. 14. which empowers lords and ladies of manors to appoint gamekeepers, to kill game for the uſe of ſuch lord or lady; which with ſome alteration ſtill ſubſiſts, and plainly ſuppoſes ſuch power not to have been in them before. The truth of the matter is, that theſe game laws do indeed *qualify* nobody, except in the inſtance of a gamekeeper, to kill game: but only to ſave the trouble and formal proceſs of an action by the perſon injured, who perhaps too might remit the offence, theſe ſtatutes Game. inflict *additional* penalties, to be recovered either in a regular or ſummary way, by any of the king's ſubjects, from certain perſons of inferior rank who may be found offending in this particular. But it does not follow that perſons excuſed from theſe additional penalties are therefore *authorized* to kill game. The circumſtance of having 100l. per annum, and the reſt, are not properly qualifications, but exemptions. And theſe perſons ſo exempted from the penalties of the game ſtatutes, are not only liable to actions of treſpaſs by the owners of the land; but alſo if they kill game within the limits of any royal franchiſe, they are liable to the actions of ſuch who may have the right of chaſe or free warren therein.

Upon the whole it appears, that the king, by his prerogative, and ſuch perſons as have, under his authority, the ROYAL FRANCHISE of CHACE, PARK, or *Free* WARREN†, are the *only* perſons who may acquire any property, however fugitive and tranſitory, in theſe animals *feræ naturæ*, while living; which is ſaid to be veſted in them *propter privilegium*. And it muſt alſo be obſerved, that ſuch perſons as may thus lawfully hunt, fiſh, or fowl, *ratione privilegii*, have only a qualified property in theſe animals; it not being abſolute or permanent, but laſting only ſo long as the creatures remain within the limits of ſuch reſpective franchiſe or liberty, and ceaſing the inſtant they voluntarily paſs out of it. It is held indeed, that if a man ſtarts any game within his own grounds, and follows it into another's and kills it there, the property remains in himſelf. And this is grounded on reaſon and natural juſtice; for the property conſiſts in the poſſeſſion; which poſſeſſion commences by the finding it in his own liberty, and is continued by the immediate purſuit. And ſo, if a ſtranger ſtarts game in one man's chaſe or free warren, and hunts it into another liberty, the property continues in the owner of the chaſe or warren; this property ariſing from privilege, and not being changed by the act of a mere ſtranger. Or if a man ſtarts game on another's private grounds, and kills it there, the property belongs to him in whoſe ground it was killed, becauſe it was alſo ſtarted there; this property ariſing *ratione ſoli*. Whereas if, after being ſtarted there, it is killed in the grounds of a third perſon, the property belongs not to the owner of the firſt ground, becauſe the property is local; nor yet to the owner of the ſecond, becauſe it was not ſtarted in his ſoil; but it veſts in the perſon who ſtarted and killed it; though guilty of a treſpaſs againſt both the owners. See the article *Game Laws*.

† See thoſe articles.

It will probably be conſidered by ſportſmen who have not an opportunity of ſeeing the book, as a curious piece of information, to have the following, which we extract from Daniel's Rural Sports, concerning the quantity of game killed in different countries.

"The liſts of the game, ſays he, that has been killed upon particular manors in England by parties, and even by ſingle gentlemen, exhibit ſuch a wanton regiſtry of ſlaughter, as no ſportſman can read without regret; but to prove that *Britiſh* are rather more merciful than *French* ſhooters, the account of the former game eſtabliſhment at Chantilli is firſt preſented to the reader, in the words of the very ingenious perſon who recorded it.

Game. "The game eſtabliſhment at Chantilli was the moſt extraordinary eſtabliſhment of the kind in Europe.

"The following liſt of the quantity of different kinds of game killed at Chantilli, in a period of 32 years, beginning with the year 1748, and ending with the year 1779, was copied from the houſehold regiſters there, and what ſeems unaccountable, never was printed before, not even in France! The copy was taken in 1788, and the ſtatement, as an object in natural hiſtory, is no ſmall curioſity, and as ſuch it is philoſophically intereſting.

Hares	77,750
Rabbits	587,470
Partridges	116,574
Red, ditto	12,426
Pheaſants	86,193
Quails	19,696
Ralles	449
Woodcocks	2164
Snipes	2856
Ducks	1353
Wood pigeons	317
Curlews	32
Buſtards	2
Larks	106
Thruſhes	1313
Stags	1682
Hinds	1682
Fawns	519
Does	1921
Young does	135
Roe-bucks	4669
Young, ditto	810
Wild boars	1942
Marcaſſins	818

Connected with this eſtabliſhment, there was a park of 21 miles, and a foreſt of 48 miles in extent, and while the family were at the place, they had 500 horſes, as many ſervants, and from 60 to 80 couple of dogs.

"The Germans too, ſays Mr Daniel, have a happy knack at a maſſacre. In 1788 a party of 10 perſons at the chateau of Prince Adam Daverſperg, in Bohemia, were out five hours on the 9th and 10th of September, allowed that the firſt day 6168 ſhots were fired, and 876 hares, 259 pheaſants, 362 partridges, beſide quails, rabbits, &c. were bagged, or rather waggoned. On the ſecond day 5904 ſhots were diſcharged, and 181 hares, 634 pheaſants, and 736 partridges were killed, beſides ſome that were picked up in the evening. The number of ſhots in the two days were 11,972, the game carried home were

Hares,	1099
Pheaſants,	958
Partridges,	1201

beſides ſmall game. It is added that the birds were all ſhot on the wing.

"In Germany, during the month of October 1797, Prince Lichtenſtein, and eleven other gentlemen, killed in one day, when they were out fourteen hours, 39,000 pieces of game; it was of all ſorts, but chiefly hares and partridges. The king of Naples and Sir W. Hamilton killed 800 head of game in the neighbourhood of Caſarte, of which 640 were partridges, in a very ſhort ſpace of time. Game || Gaming.

"Upon Mr Colquhoun's manor in our own country, at Writham in Norfolk, the late duke of Bedford, and ſix other gentlemen, in 1796, killed 80 cock pheaſants, 40 hares, beſides partridges, in one day. At Houghton, in the ſame county, the duke of Bedford, and ſeven others, killed in the ſame ſpace, 165 hares, 42 pheaſants, 5 rabbits, a couple of woodcocks, and a brace of partridges; and this was done, although the woods had been beat five times before during the ſeaſon *." * Vol. ii.

GAME Cock, a fighting cock, or one kept for ſport; a barbarous practice, which is a diſgrace to any civilized nation. See *COCK-Fighting*.

GAMELIA, in Grecian antiquity, a nuptial feaſt, or rather ſacrifice, held in the ancient Greek families on the day before a marriage; thus called from a cuſtom they had of ſhaving themſelves on this occaſion, and preſenting their hair to ſome deity to whom they had particular obligations.

GAMELION, in the ancient chronology, was the eighth month of the Athenian year, containing 29 days, and anſwering to the latter part of our January and beginning of February. It was thus called, as being, in the opinion of the Athenians, the moſt proper ſeaſon of the year for marriage.

GAMING, the art of playing or practiſing any game, particularly thoſe of hazard; as cards, dice, tables, &c.

Gaming has at all times been looked upon as a thing of pernicious conſequence to the commonwealth; and is therefore ſeverely prohibited by law. It is conſidered as a practice generally intended to ſupply, or retrieve, the expences occaſioned by LUXURY: it being a kind of tacit confeſſion, that the company engaged therein do, in general, exceed the bounds of their reſpective fortunes; and therefore they caſt lots to determine upon whom the ruin ſhall at preſent fall, that the reſt may be ſaved a little longer. But taken in any light, it is an offence of the moſt alarming nature, tending by neceſſary conſequence, to promote public idleneſs, theft, and debauchery, among thoſe of a lower claſs; and, among perſons of a ſuperior rank, it hath frequently been attended with the ſudden ruin and deſolation of ancient and opulent families, and abandoned proſtitution of every principle of honour and virtue, and too often hath ended in ſelf-murder. To reſtrain this pernicious vice among the inferior ſort of people, the ſtatute 33 Hen. VIII. c. 9. was made; which prohibits to all but gentlemen, the games of tennis, tables, cards, dice, bowls, and other unlawful diverſions there ſpecified, unleſs in the time of Chriſtmas, under pecuniary pains and impriſonment. And the ſame law, and alſo the ſtatute 23 Geo. II. c. 24. inflict pecuniary penalties, as well upon the maſter of any public houſe wherein ſervants are permitted to game, as upon the ſervants themſelves, who are found to be gaming there. But this is not the principal ground of modern complaint: it is the gaming in high life that demands the attention of the magiſtrate; a paſſion to which every valuable conſideration is made a ſacrifice, and which we ſeem to have inherited from our anceſtors, the ancient Germans; whom Tacitus deſcribes to have been bewitched with the ſpirit of play to a moſt exor-

bitant

Gaming. bitant degree. "They addict themſelves (ſays he) to dice (which is wonderful) when ſober, and as a ſerious employment, with ſuch a mad deſire of winning or loſing, that, when ſtript of every thing elſe, they will ſtake at laſt their liberty, and their very ſelves. The loſer goes into a voluntary ſlavery; and, though younger and ſtronger than his antagoniſt, ſuffers himſelf to be bound and ſold. And this perſeverance in ſo bad a cauſe they call the point of honour: *ea eſt in re prava pervicacia, ipſi fidem vocant.*" One would almoſt be tempted to think Tacitus was deſcribing a modern Engliſhman. When men are thus intoxicated with ſo frantic a ſpirit, laws will be of little avail: becauſe the ſame falſe ſenſe of honour that prompts a man to ſacrifice himſelf, will deter him from appealing to the magiſtrate. Yet it is proper that laws ſhould be, and be known publicly, that gentlemen may conſider what penalties they wilfully incur, and what a confidence they repoſe in ſharpers; who, if ſucceſsful in play, are certain to be paid with honour, or, if unſucceſsful, have it in their power to be ſtill greater gainers by informing. For, by ſtat. 16 Car. II. c. 7. if any perſon by playing or betting ſhall loſe more than 100l. at one time, he ſhall not be compelled to pay the ſame; and the winner ſhall forfeit treble the value, one moiety to the king, the other to the informer. The ſtatute 9 Ann. c. 14. enacts, that all bonds and other ſecurities, given for money won at play, or money lent at the time to play withal, ſhall be utterly void: that all mortgages and encumbrances of lands, made upon the ſame conſideration, ſhall be and endure to the heir of the mortgager: that, if any perſon at one time loſes 10l. at play, he may ſue the winner, and recover it back by action of debt at law; and, in caſe the loſer does not, any other perſon may ſue the winner for treble the ſum ſo loſt; and the plaintiff in either caſe may examine the defendant himſelf upon oath: and that in any of theſe ſuits no privilege of parliament ſhall be allowed. The ſtatute farther enacts, that if any perſon cheats at play, and at one time wins more than 10l. or any valuable thing, he may be indicted thereupon, and ſhall forfeit five times the value, ſhall be deemed infamous, and ſuffer ſuch corporal puniſhment as in caſe of wilful perjury. By ſeveral ſtatutes of the reign of King George II. all private lotteries by tickets, cards, or dice, (and particularly the games of faro, baſſet, ace of hearts, hazard, paſſage, rolly polly, and all other games with dice, except backgammon), are prohibited under a penalty of 200l. for him that ſhall erect ſuch lotteries, and 50l. a-time for the players. Public lotteries, unleſs by authority of parliament, and all manner of ingenious devices, under the denomination of *ſales* or otherwiſe, which in the end are equivalent to lotteries, were before prohibited by a great variety of ſtatutes under heavy pecuniary penalties. But particular deſcriptions will ever be lame and deficient, unleſs all games of mere chance are at once prohibited; the invention of ſharpers being ſwifter than the puniſhment of the law, which only hunts them from one device to another. The ſtat. 13 Geo. II. c. 19. to prevent the multiplicity of horſe races, another fund of gaming, directs, that no plates or matches under 50l. value ſhall be run, upon penalty of 200l. to be paid by the owner of each horſe running, and 100l. by ſuch as advertiſe the plate. By ſtatute 18 Geo. I. c. 34. the ſtatute 9 Ann. is farther enforced, and ſome deficiencies ſupplied: the forfeitures of that act may now be recovered in a court of equity; and, moreover, if any man be convicted, upon information or indictment, of winning or loſing at any ſitting 10l. or 20l. within 24 hours, he ſhall forfeit five times the ſum. Thus careful has the legiſlature been to prevent this deſtructive vice: which may ſhow that our laws againſt gaming are not ſo deficient as ourſelves and our magiſtrates in putting thoſe laws in execution. Gaming.

Chance, or *Hazard*, in *GAMING*. Hazard, or chance, is a matter of mathematical conſideration, becauſe it admits of more and leſs. Gameſters either ſet out upon an equality of chance, or are ſuppoſed to do ſo. This equality may be altered in the courſe of the game, by the greater good fortune or addreſs of one of the gameſters, whereby he comes to have a better chance, ſo that his ſhare in the ſtakes is proportionably better than at firſt. This more and leſs runs through all the ratios between equality and infinite difference, or from an infinitely little difference till it come to an infinitely great one, whereby the game is determined. The whole game, therefore, with regard to the iſſue of it, is a chance of the proportion the two ſhares bear to each other.

The probability of an event is greater or leſs, according to the number of chances by which it may happen, compared with the number of all the chances by which it may either happen or fail.

M. de Moivre, in a treatiſe *de Menſura Sortis*, has computed the varicty of chances in ſeveral caſes that occur in gaming, the laws of which may be underſtood by what follows.

Suppoſe p the number of caſes in which an event may happen, and q the number of caſes wherein it may not happen, both ſides have the degree of probability, which is to each other as p to q.

If two gameſters, A and B, engage on this footing, that, if the caſes p happen, A ſhall win; but if q happen, B ſhall win, and the ſtake be a; the chance of A will be $\frac{pa}{q+p}$, and that of B $\frac{qa}{p+q}$; conſequently, if they ſell the expectancies, they ſhould have that for them reſpectively.

If A and B play with a ſingle dice, on this condition, that, if A throw two or more aces at eight throws, he ſhall win; otherwiſe B ſhall win; What is the ratio of their chances? Since there is but one caſe wherein an ace may turn up, and five wherein it may not, let $a=1$, and $b=5$. And again, ſince there are eight throws of the die, let $n=8$; and you will have $\overline{a+b}|^n - b^n - n\,a\,b^{n-1}$, to $b^n + n\,a\,b^{n-1}$: that is, the chance of A will be to that of B as 663991 to 101565 25, or nearly as 2 to 3.

A and B are engaged at ſingle quoits; and, after playing ſome time, A wants 4 of being up, and B 6; but B is ſo much the better gameſter, that his chance againſt A upon a ſingle throw would be as 3 to 2; What is the ratio of their chances? Since A wants 4, and B 6, the game will be ended at nine throws; therefore, raiſe $a+b$ to the ninth power, and it will be $a^9+9\,a^8b+36\,a^7b\,b+84\,a^6b^3+126\,a^5b^4+126\,a^4b^5$ to $84\,a^3b^6+36\,a\,a\,b^7+6\,a\,b^3+b^9$: call a 3, and b 2, and you will have the ratio of chances in numbers, viz. 1759077 to 194048.

Gaming. A and B play at ſingle quoits, and A is the beſt gameſter, ſo that he can give B 2 in 3: What is the ratio of their chances at a ſingle throw? Suppoſe the chances as x to 1, and raiſe $x+1$ to its cube, which will be x^3+3x^2+3x+1. Now ſince A could give B 2 out of 3, A might undertake to win three throws running; and conſequently the chances in this caſe will be as x^3 to $3x^2+3x+1$. Hence $x^3=3x^2+3x+1$; or $2x^3=x^3+3x^2-3x+1$. And therefore $x\sqrt[3]{2}=x+1$; and, conſequently, $x=\frac{1}{\sqrt[3]{2}-1}$. The chances, therefore, are $\frac{1}{\sqrt[3]{2}-1}$, and 1, reſpectively.

Again, ſuppoſe I have two wagers depending, in the firſt of which I have 3 to 2 the beſt of the lay, and in the ſecond 7 to 4; What is the probability I win both wagers?

1. The probability of winning the firſt is $\frac{3}{5}$, that is, the number of chances I have to win, divided by the number of all the chances: the probability of winning the ſecond is $\frac{7}{11}$: therefore, multiplying theſe two fractions together, the product will be $\frac{21}{55}$, which is the probability of winning both wagers. Now, this fraction being ſubtracted from 1, the remainder is $\frac{34}{55}$, which is the probability I do not win both wagers: therefore the odds againſt me are 34 to 21.

2. If I would know what the probability is of winning the firſt, and loſing the ſecond, I argue thus; the probability of winning the firſt is $\frac{3}{5}$, the probability of loſing the ſecond is $\frac{4}{11}$: therefore multiplying $\frac{3}{5}$ by $\frac{4}{11}$, the product $\frac{12}{55}$ will be the probability of my winning the firſt and loſing the ſecond; which being ſubtracted from 1, there will remain $\frac{43}{55}$, which is the probability I do not win the firſt, and at the ſame time loſe the ſecond.

3. If I would know what the probability is of winning the ſecond, and at the ſame time loſing the firſt, I ſay thus: The probability of winning the ſecond is $\frac{7}{11}$; the probability of loſing the firſt is $\frac{2}{5}$: therefore, multiplying theſe two fractions together, the product $\frac{14}{55}$ is the probability I win the ſecond, and alſo loſe the firſt.

4. If I would know what the probability is of loſing both wagers, I ſay, the probability of loſing the firſt is $\frac{2}{5}$, and the probability of loſing the ſecond $\frac{4}{11}$: therefore the probability of loſing them both is $\frac{8}{55}$: which, being ſubtracted from 1, there remains $\frac{47}{55}$: therefore, the odds of loſing both wagers is 47 to 8.

This way of reaſoning is applicable to the happening or failing of any events that may fall under conſideration. Thus if I would know what the probability is of miſſing an ace four times together with a die, this I conſider as the failing of four different events. Now the probability of miſſing the firſt is $\frac{5}{6}$, the ſecond is alſo $\frac{5}{6}$, the third $\frac{5}{6}$, and the fourth $\frac{5}{6}$; therefore the probability of miſſing it four times together is $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{625}{1296}$; which being ſubſtracted from 1, there will remain $\frac{671}{1296}$ for the probability of throwing it once or oftener in four times; therefore the odds of throwing an ace in four times, is 671 to 625.

But if the flinging of an ace was undertaken in three times, the probability of miſſing it three times would be $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{125}{216}$; which being ſubtracted from 1, there will remain $\frac{91}{216}$ for the probability of throwing it once or oftener in three times: therefore the odds againſt throwing it in three times are 125 to 91. Again, ſuppoſe we would know the probability of throwing an ace once in four times, and no more; ſince the probability of throwing it the firſt time is $\frac{1}{6}$, and of miſſing it the other three times, is $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}$, it follows, that the probability of throwing it the firſt time, and miſſing it the other three ſucceſſive times, is $\frac{1}{6}\times\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{125}{1296}$; but becauſe it is poſſible to hit every throw as well as the firſt, it follows, that the probability of throwing it once in four throws, and miſſing it the other three, is $\frac{4\times125}{1296}=\frac{500}{1296}$; which being ſubtracted from 1, there will remain $\frac{796}{1296}$ for the probability of throwing it once, and no more, in four times. Therefore, if one undertake to throw an ace once, and no more, in four times, he has 500 to 796 the worſt of the lay, or 5 to 8 very near. Gaming.

Suppoſe two events are ſuch, that one of them has twice as many chances to come up as the other; what is the probability that the event which has the greater number of chances to come up, does not happen twice before the other happens once, which is the caſe of flinging 7 with two dice before 4 once? Since the number of chances is as 2 to 1, the probability of the firſt happening before the ſecond is $\frac{2}{3}$, but the probability of its happening twice before it is but $\frac{2}{3}\times\frac{2}{3}$ or $\frac{4}{9}$: therefore it is 5 to 4, ſeven does not come up twice before four once.

But, if it were demanded, what muſt be the proportion of the facilities of the coming up of two events, to make that which has the moſt chances come up twice, before the other comes up once? The anſwer is, 12 to 5 very nearly: whence it follows, that the probability of throwing the firſt before the ſecond is $\frac{12}{17}$, and the probability of throwing it twice is $\frac{12}{17}\times\frac{12}{17}$, or $\frac{144}{289}$; therefore the probability of not doing it is $\frac{145}{289}$; therefore the odds againſt it are as 145 to 144, which comes very near an equality.

Suppoſe there is a heap of thirteen cards of one colour, and another heap of thirteen cards of another colour; What is the probability, that, taking one card at a venture out of each heap, I ſhall take out the two aces?

The probability of taking the ace out of the firſt heap is $\frac{1}{13}$; the probability of taking the ace out of the ſecond heap is $\frac{1}{13}$; therefore the probability of taking out both aces is $\frac{1}{13}\times\frac{1}{13}=\frac{1}{169}$, which being ſubtracted from 1, there will remain $\frac{168}{169}$: therefore the odds againſt me are 168 to 1.

In caſes where the events depend on one another, the manner of arguing is ſomewhat altered. Thus, ſuppoſe that out of one ſingle heap of thirteen cards of one colour I ſhould undertake to take out firſt the ace; and, ſecondly, the two: though the probability of taking out the ace be $\frac{1}{13}$, and the probability of taking out the two be likewiſe $\frac{1}{13}$: yet, the ace being ſuppoſed as taken out already, there will remain only twelve cards in the heap, which will make the probability of taking out the two to be $\frac{1}{12}$; therefore the probability of taking out the ace, and then the two, will be $\frac{1}{13}\times\frac{1}{12}$.

In this laſt queſtion the two events have a dependence on each other; which conſiſts in this, that one of the events

Gaming || Ganges.

events being ſuppoſed as having happened, the probability of the other's happening is thereby altered. But the caſe is not ſo in the two heaps of cards.

If the events in queſtion be n in number, and be ſuch as have the ſame number a of chances by which they may happen, and likewiſe the ſame number b of chances by which they may fail, raiſe $a+b$ to the power n. And if A and B play together, on condition that if either one or more of the events in queſtion happen, A ſhall win, and B loſe, the probability of A's winning will be $\frac{\overline{a+b}|^n - b^n}{\overline{a+b}|^n}$; and that of B's winning will be $\frac{b^n}{\overline{a+b}|}$; for when $a+b$ is actually raiſed to the power n, the only term in which a does not occur is the laſt b^n: therefore all the terms but the laſt are favourable to A.

Thus if $n=3$, raiſing $a+b$ to the cube $a^3+3a^2b+3ab^2+b^3$, all the terms but b^3 will be favourable to A; and therefore the probability of A's winning will be $\frac{a^3+3a^2b+3ab^2}{\overline{a+b}|}$, or $\frac{\overline{a+b}|^3 - b^3}{\overline{a+b}|^3}$; and the probability of B's winning will be $\frac{b^3}{\overline{a+b}|^3}$. But if A and B play on condition, that if either two or more of the events in queſtion happen, A ſhall win; the probability of A's winning will be $\frac{\overline{a+b}|^n - nab^{n-1} - b^n}{\overline{n+b}|^n}$; for the only two terms in which aa does not occur are the two laſt, viz. nab^{n-1} and b^n.

GAMMONING, among ſeamen, denotes ſeveral turns of a rope taken round the bowſprit, and reeved through holes in knees of the head, for the greater ſecurity of the bowſprit.

GAMMUT, GAMUT, *GAM-ut*, in *Muſic*, a ſcale whereon we may learn to ſound the muſical notes, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, in their ſeveral orders and diſpoſitions. See MUSIC.

The invention of this ſcale is owing to Guido Aretin, a monk of Arezzo, in Tuſcany, about the year 1009; though it is not ſo properly an invention, as an improvement on the diagram or ſcale of the ancients. See ARETIN.

Several alterations have been made in the gammut. M. Le Maire, particularly, has added a ſeventh note; viz. *ſi*; and the Engliſh uſually throw out both *ut* and *ſi*, and make the other five ſerve for all.

GANDER, in *Ornithology*, the male of the gooſe kind. See ANAS, ORNITHOLOGY *Index*.

GANG-WAY, is the ſeveral paſſages or ways from one part of the ſhip to the other; and whatſoever is laid in any of thoſe paſſages is ſaid to lie in the gang-way.

GANGANELLI. See CLEMENT XIV.

GANGES, a large and celebrated river of India. It has its ſource in the mountains which border on Little Thibet, in 96 degrees of longitude, and 35° 45′ of latitude. It croſſes ſeveral kingdoms, running from north to ſouth; and falls into the bay of Bengal by ſeveral mouths. The waters are loweſt in April and May, and higheſt before the end of September. It overflows yearly like the Nile; and renders the kingdom of Bengal as fruitful as that of the Delta in Egypt. The people in theſe parts hold the water of this river in high veneration; and it is viſited annually by a prodigious number of pilgrims from all parts of India. The greateſt happineſs that many of the Indians wiſh for, is to die in this river. The Engliſh have ſeveral ſettlements on this river, which will be taken notice of in their proper places.

Ganges || Gaol.

GANGLION, in *Anatomy*, denotes a knot frequently found in the courſe of the nerves, and which is not morbid; for wherever any nerve ſends out a branch, or receives one from another, or where two nerves join together, there is generally a ganglion or plexus, as may be ſeen at the beginning of all the nerves of the medulla ſpinalis, and in many other places of the body.

GANGLION, in *Surgery*, a hard tubercle, generally moveable, in the external or internal part of the carpus, upon the tendons or ligaments in that part; uſually without any pain to the patient.

GANGRENE, a very great and dangerous degree of inflammation, wherein the parts affected begin to corrupt, and put on a ſtate of putrefaction. See MEDICINE, and SURGERY.

GANNET, or *SOLAND Gooſe*, in *Ornithology*. See PELICANUS, ORNITHOLOGY *Index*.

GANTLET, or GAUNTLET, a large kind of glove made of iron, and the fingers covered with ſmall plates. It was formerly worn by the cavaliers, when armed at all points. The word is derived of the French *gantelet*; and that from *gand*, or *gant*, "glove."

The caſque and gauntlets were always borne in the ancient marches in ceremony. Gauntlets were not introduced till about the 13th century.

The gauntlet was frequently thrown like the glove, by way of challenge.

GANTLOPE. See GAUNTLOPE.

GANYMEDE, in mythology, a beautiful youth of Phrygia, ſon of Tros and brother to Ilus; according to Lucian, he was the ſon of Dardanus. Jupiter was charmed with him; and carrying him away, made him his cupbearer in the room of Hebe. Some ſay that he cauſed him to be carried away by an eagle, and others affirm he was himſelf the raviſher under the form of that bird. He deified this youth; and to comfort his father made a preſent to him of ſome of thoſe very ſwift horſes upon which the gods rode.

GAOL (*Gaola*. Fr. *Geole*, i. e. *Caveola*, "a cage for birds"), is uſed metaphorically for a priſon. It is a ſtrong place or houſe for keeping of debtors, &c. and wherein a man is reſtrained of his liberty to anſwer an offence done againſt the laws: and every county hath two gaols, one for debtors, which may be any houſe where the ſheriff pleaſes; the other for the peace and matters of the crown, which is the county gaol.

If a gaol be out of repair, or inſufficient, &c. juſtices of peace, in their quarter ſeſſions, may contract with workmen for the rebuilding or repairing it; and by their warrant order the ſum agreed on for that purpoſe to be levied on the ſeveral hundreds, and other diviſions in the county, by a juſt rate, 11 and 12 Will. III. c. 19. See PRISON.

GAOL Delivery. The adminiſtration of juſtice being originally in the crown, in former times our kings

in-

Gaol || Garamond.

in perſon rode through the realm once in ſeven years, to judge of and determine crimes and offences; afterwards juſtices in eyre were appointed; and ſince, juſtices of aſſize and gaol delivery, &c. A commiſſion of gaol delivery, is a patent in nature of a letter from the king to certain perſons, appointing them his juſtices, or two or three of them, and authorizing them to deliver his gaol, at ſuch a place, of the priſoners in it: for which purpoſe it commands them to meet at ſuch a place, at the time they themſelves ſhall appoint; and informs them, that, for the ſame purpoſe, the king hath commanded his ſheriff of the ſame county to bring all the priſoners of the gaol, and their attachments, before them at the day appointed.

The juſtices of gaol delivery are empowered by the common law to proceed upon indictments of felony, treſpaſs, &c. and to order to execution or reprieve: they may likewiſe diſcharge ſuch priſoners, as on their trials are acquitted, and thoſe againſt whom, on proclamation being made, no evidence has appeared: they have authority to try offenders for treaſon, and to puniſh many particular offences, by ſtatute, 2 *Hawk.* 24. 2. *Hale's Hiſt. Placit. Cor.* 35.

GAOLER, the keeper of a gaol or priſon. Sheriffs are to make ſuch gaolers for whom they will be anſwerable: but if there be any default in the gaoler, an action lies againſt him for an eſcape, &c. yet the ſheriff is moſt uſually charged; 2d Inſt. 592. Where a gaoler kills a priſoner by hard uſage, it is felony; 3d Inſt. 52. No fee ſhall be taken by gaolers, but what is allowed by law, and ſettled by the judges, who may determine petitions againſt their extortions, &c. 2 Geo. II. c. 22.

GAONS, a certain order of Jewiſh doctors, who appeared in the Eaſt, after the cloſing of the Talmud. The word *Gaons* ſignifies "excellent, ſublime;" as in the divinity ſchools we formerly had Irrefragable, Sublime, Reſolute, Angelic, and Subtile doctors. The Gaons ſucceeded the Seburæans or Opiners about the beginning of the ſixth century. Chanan Meiſchtia was the head and firſt of the excellents. He reſtored the academy of Pandebita, which had been ſhut up for 30 years.

GAR FISH, *Horn fiſh*, or *Sea needle*. See Esox, Ichthyology *Index*.

GARAMA, in *Ancient Geography*, the capital of the Garamantes in Libya Interior; near the ſprings of the Cinyphus, now in ruins. Garamantes the people. It lay to the ſouth of Gætulia, extending from the ſprings of the Cinyphus, and the adjacency of the river Gir, to the mountains which form at the *Vallis Garamantica* (Pliny): or from the ſprings of the Bagrades to the lake Nuba (Ptolemy).

GARAMOND, Claude, a very ingenious letter-founder, was born at Paris; where he began, in the year 1510, to found his printing types free from all the remains of the Gothic, or (as it is generally called) the *black letter*, and brought them to ſuch perfection, that he had the glory of ſurpaſſing all who went before him, and of being ſcarcely ever excelled by his ſucceſſors in that uſeful art. His types were prodigiouſly multiplied: both by the great number of matrices he ſtruck, and the types formed in reſemblance of his in all parts of Europe. Thus in Italy, Germany, England, and Holland, the bookſellers, by way of recommending their books, diſtinguiſhed the type by his name; and in particular the ſmall Roman was by way of excellence known among the printers of theſe nations by the name of *Garamond's ſmall Roman*. By the ſpecial command of King Francis I. he founded three ſizes of Greek types for the uſe of Robert Stephens, who with them printed all his beautiful editions of the New Teſtament, and other Greek authors. He died at Paris in 1561.

Garamond || Garcilaſſo.

GARASSE, Francis, a remarkable Jeſuitical writer, the firſt author of that irreconcilable enmity that ſtill ſubſiſts between the Jeſuits and Janſeniſts, in the church of Rome, was born at Angouleſme in 1585, and entered the Jeſuits college in 1600. As he had a quick imagination, a ſtrong voice, and a peculiar turn to wit, he became a popular preacher in the chief cities of France; but not content with this honour, he diſtinguiſhed himſelf ſtill more by his writings, which were bold, licentious, and produced much controverſy. The moſt conſiderable in its conſequences was entitled *La ſomme theologique des veritez capitales de la religion Cretienne;* which was firſt attacked by the abbot of St Cyran, who obſerving in it a prodigious number of falſifications of the Scriptures and of the fathers, beſides many heretical and impious opinions, conceived the honour of the church required him to undertake a refutation. Accordingly he publiſhed a full anſwer to it; while Garaſſe's book was alſo under examination of the doctors of the Sorbonne, by whom it was afterwards condemned. Garaſſe replied to St Cyran; but the two parties of Jeſuits and Janſeniſts, of whom theſe were reſpectively the champions, grew to an implacable animoſity againſt each other, that is not even now likely to ſubſide. The Jeſuits were foreed to remove their brother to a diſtance from Paris; where, probably weary of his inactive obſcurity, when the plague raged at Poictiers in 1631, he begged leave of his ſuperior to attend the ſick, in which charitable office he caught the diſorder, and died.

GARBE, in *Heraldry*, a ſheaf of any kind of grain, borne in ſeveral coats of arms, and ſaid to repreſent ſummer, as a bunch of grapes does autumn.

GARBLE, a word uſed to ſignify the action of ſeparating the droſs and duſt from ſpice, drugs, &c. *Garbling* is the cleanſing and purifying the good from the bad; and many come from the Italian *garbo;* i. e. finery or neatneſs: and hence, probably, we ſay, when we ſee a man in a neat habit, that he is in handſome *garb*.

GARCILASSO, de la Vega, an eminent Spaniſh poet, was born at Toledo, in 1503. He was the younger ſon of a man of rank, who had been employed in negociating buſineſs of importance. Garcilaſſo was diſtinguiſhed for his wit and bravery, and in a particular manner for his poetical talents. He was chiefly inſtrumental in giving popularity to an innovation of his friend Boſcan, who introduced meaſures borrowed from the Italians. His works conſiſt chiefly of paſtorals, which have a tedious prolixity. He is chiefly noted for tenderneſs, which is remarkably conſpicuous in ſome of his ſonnets. He is freer of bombaſt than the generality of his countrymen, owing to his familiar acquaintance with the ancients; and it is ſaid that his learning and taſte were ſuperior to his genius. He followed the profeſſion of arms, and attended Charles V. in

Garcilaſſo in a number of his expeditions. He loſt his life at the attack of a fortreſs in Provence, when only 33 years of age. Garcilaſſo is alſo the name of an author, a native of Cuſco in Peru, who compoſed a hiſtory of Florida in the Spaniſh language, and another of Peru and its Incas.

GARCINIA, a genus of plants belonging to the dodecandria claſs; and in the natural method ranking under the 18th order, *Bicornes*. See BOTANY *Index*.

GARCON, or GARSOON, a French term, literally ſignifying a boy or male child any time before his marriage.—It is alſo applied to divers inferior officers, among us called *groom*, *garçiones*. Thus all the ſervants in the French king's chambers, wardrobe, &c. who performed the leſſer offices under the proper officers, were called *garçons de la chambre*, *de la garderobe*, &c.

GARDANT, or GUARDANT, in *Heraldry*, denotes any beaſt full faced, and looking right forward.

GARDEN, FRANCIS, better known to the public by the title of *Lord Gardenſtone*, was born at Edinburgh June 24th, in the year 1721. His father was Alexander Garden of Troup, an opulent landholder in Aberdeenſhire; his mother was Jane, daughter of Sir Francis Grant of Cullen, S. C. I.

After paſſing through the uſual courſe of liberal education at the ſchool and the univerſity, he betook himſelf to the ſtudy of law for his profeſſion; and in the year 1744 he was admitted a member of the Faculty of Advocates, and called to the Scottiſh bar.

In his practice as an advocate he ſoon began to be diſtinguiſhed, by a ſtrong native rectitude of underſtanding; by that vivacity of apprehenſion and imagination, which is commonly denominated *genius*; by manly candour in argument, often more perſuaſive than ſubtlety and ſophiſtical artifice; by powers which, with diligence, might eaſily attain to the higheſt eminence of the profeſſion. But the ſame ſtrength, openneſs, and ardour of mind, which diſtinguiſhed him ſo advantageouſly among the pleaders at the bar, tended to give him a fondneſs for the gay enjoyments of convivial intercourſe, which was unfavourable to his progreſs in juridical erudition. Shining in the ſocial and convivial circle, he became leſs ſolicitouſly ambitious than he might otherwiſe have been, of the character of an eloquent advocate, or of a profound and learned lawyer. The vivacity of his genius was averſe from auſtere and plodding ſtudy, while it was captivated by the faſcinations of polite learning, and of the fine arts. Nor did he always eſcape thoſe exceſſes in the purſuit of pleaſure into which the temptations of opening life are apt, occaſionally, to ſeduce the moſt liberal and ingenuous youth. But his cheerful conviviality, his wit, humour, taſte, good-nature, and benevolence of heart, rendered him the delight of all his acquaintance. He became his majeſty's ſolicitor July 3d, 1764.

At length the worth of his character, and his abilities as a lawyer, recommended him to the office of a judge in the courts of ſeſſion and juſticiary, the ſupreme judicatures, civil and criminal, for Scotland. His place in the court of ſeſſion he continued to occupy till his death; but had, ſome years before, reſigned the office of a commiſſioner of juſticiary, and in recompence got a penſion of 200l. per. annum. Clear diſcernment, ſtrong good ſenſe, conſcientious honeſty, and amiable benevolence, remarkably diſtinguiſhed all his opinions and conduct as a judge. Garden.

In the year 1762 he purchaſed the eſtate of Johnſton, in the county of Kincardine. Within a few years after he began to attempt a plan of the moſt liberal improvement of the value of this eſtate, by an extenſion of the village of Laurencekirk, adjoining. He offered leaſes of ſmall farms, and of ground for building upon, which were to laſt for the term of one hundred years; and of which the conditions were extremely inviting to the labourers and tradeſmen of the ſurrounding country. Theſe offers were eagerly liſtened to. More deſirous to make the attempt beneficial to the country than to derive profit from it to himſelf, he was induced, within a few years, to reduce his groundrents to one-half of the original rate.—Weavers, joiners, ſhoemakers, and other artiſans in a conſiderable number, reſorted to ſettle in the riſing village. His lordſhip's earneſtneſs for the ſucceſs of his project, and to promote the proſperity of the good people whom he had received under his protection, led him to engage in ſeveral undertakings; by the failure of which he incurred conſiderable loſſes. Projects of a printfield, and of manufactures of linen and of ſtockings, attempted with ſanguine hopes in the new village, and chiefly at his lordſhip's riſk and expence, miſgave in ſuch a manner as might well have finally diſguſted a man of leſs ſteady and ardent philanthropy with every ſuch engagement. But the village ſtill continued to advance. It grew up under his lordſhip's eye, and was the favourite object of his care. In the year 1779, he procured it to be erected into a burgh of barony; having a magiſtracy, an annual fair, and a weekly market. He provided in it a good inn for the reception of travellers; and with an uncommon attention to the entertainment of the gueſts who might reſort to it, furniſhed this inn with a library of books for their amuſement. He invited an artiſt for drawing, from the continent, to ſettle at Laurencekirk. He had the pleaſure of ſeeing a conſiderable linen-manufacture at length fixed in it. A bleachfield was alſo eſtabliſhed as a natural counterpart to the linen-manufacture. Before his lordſhip's death, he ſaw his plan of improving the condition of the labourers, by the formation of a new village at Laurencekirk, crowned with ſucceſs beyond his moſt ſanguine hopes. He has acknowledged, with an amiable frankneſs, in a memoir concerning this village, "That he had tried, in ſome meaſure, a variety of the pleaſures which mankind purſue; but never reliſhed any ſo much as the pleaſure ariſing from the progreſs of his village."

In the year 1785, upon the death of his elder brother, Alexander Garden of Troup, M. P. for Aberdeenſhire, Lord Gardenſtone ſucceeded to the poſſeſſion of the family eſtates, which were very conſiderable. Until this time his lordſhip's income had never been more than adequate to the liberal expence into which his rank, and the generoſity of his nature, unavoidably led him. But the addition of a fortune of about three thouſand pounds a-year to his former revenue, gave him the power of performing many acts of beneficence with which he could not before gratify his good heart. It was happy, likewiſe, that his ſucceſſion to this ample income, at a period when the vigour

Garden. of his conſtitution was rapidly yielding to the infirmities of old age, enabled him to ſeek relief, by a partial ceſſation from buſineſs, by travel, and by other means, which could not have been eaſily compatible with the previous ſtate of his fortune.

In the month of Sept. 1786, he ſet out from London for Dover, and paſſed over into France. After viſiting Paris, he proceeded to Provence, and ſpent the winter months in the genial climate of Hieres. In the ſpring of 1787 he returned northwards, viſiting Geneva, Switzerland, the Netherlands, and the Dutch provinces, and paſſing through Germany into Italy. With a fond curioſity, attentive alike to the wonders of nature, to the noble monuments of the arts, and to the awful remains of ancient grandeur, with which Italy abounds, he viſited all its great cities, and ſurveyed almoſt every remarkable and famous ſcene that it exhibits.

His firſt object, in theſe travels, was to obtain the reſtoration of his declining health by the influence of a milder climate, by gentle, continued, and varied exerciſe; by that pleaſing exhilaration of the temper and ſpirits, which is the beſt medicine to health, and is moſt ſucceſsfully produced by frequent change of place, and of the objects of attention. But the curioſities of nature and art, in thoſe countries through which he travelled, could not fail to attract, in a powerful manner, the curioſity of a mind cultivated and ingenious as his. He, whoſe breaſt glowed with the moſt ardent philanthropy, could not view the varied works and manners of a diverſity of nations of his fellow men, without being deeply intereſted by all thoſe circumſtances which might appear to mark their fortunes as happy or wretched. He eagerly collected ſpecimens of the ſpars, the ſhells, the ſtrata of rocks, and the veins of metals, in the ſeveral countries through which he paſſed. He amaſſed alſo cameos, medals, and paintings. He enquired into ſcience, literature, and local inſtitutions. He wrote down his obſervations, from time to time; not indeed with the minute care of a pedant, or the oſtentatious labour of a man travelling with a deſign to publiſh an account of his travels; but ſimply to aid memory and imagination in the future remembrance of objects uſeful or agreeable.

After an abſence of about three years, he returned to his native country. The laſt years were ſpent in the diſcharge of the duties of his office as a judge; in ſocial intercourſe with his friends, among whom was the venerable Lord Monboddo, and others of the moſt reſpectable characters that our country has to boaſt of; in the performance of a thouſand generous offices of benevolence and humanity; in cheriſhing thoſe fine arts, of which he was an eminent admirer and judge; and above all, in promoting the comfort, and encouraging the induſtry of his dependants, and in lending his aid to every rational attempt at the improvement of public economy and public virtue.

St Bernard's Well, in the neighbourhood of Edinburgh, had been, long ſince, diſtinguiſhed for the medicinal virtues of its waters. But various circumſtances had alſo concurred of late to throw it into neglect. Yet its waters being ſtrongly mineralized by a ſulphurated hydrogenous gas, were, by this means, unqueſtionably qualified to operate, with highly beneficial effects, in the cure of various diſeaſes. The qualities of this mineral water falling under Lord Gardenſtone's notice, he was induced to purchaſe the property of the well, to direct it to be cleared from ſurrounding obſtacles, which contaminated the virtues of the water, or made it inacceſſible; to erect a beautiful and commodious edifice over it; and to appoint proper perſons to diſtribute the water, for a very trivial compenſation, to the public. The well lies at a diſtance from Edinburgh, which is very convenient for a ſummer morning's walk. Within the few years which have paſſed ſince Lord Gardenſtone's benevolent care brought it into notice, it has attracted many of the inhabitants of that city to viſit in the mornings of ſpring and ſummer. And, undoubtedly, the agreeable exerciſe to which they have thus been allured, and the ſalutary effects of the water, have contributed, in no mean degree, to diſpel diſeaſe, and to confirm, or re-eſtabliſh health. Such monuments are worthy to preſerve the memory of a patriotic and a good man!

Gard.

As an amuſement for the laſt two or three years of his life, when his increaſing infirmities precluded him from more active exerciſe, and from mingling ſo frequently in the ſociety of his friends as was agreeable to his ſocial and convivial temper, he bethought himſelf of reviſing ſome of the *jeux d'eſprit*, and light fugitive pieces, in which he had indulged the gaiety of his fancy, in his earlier days; and a ſmall volume of poems was publiſhed, in which the beſt pieces are, upon good authority, aſcribed to Lord Gardenſtone. He reviſed alſo the memorandums which he had made upon his travels, and permitted them to be ſent to preſs. The two former volumes were publiſhed one after another while his lordſhip was yet alive; the third after his death. They met with a very favourable reception in the world, and were honoured with the high approbation of the moſt reſpectable writers of periodical criticiſm. They convey much agreeable information, and beſpeak an elegant, enlightened, and amiable mind. The laſt volume is filled chiefly with memorandums of his lordſhip's travels in Italy; and contains many intereſting criticiſms upon ſome of the nobleſt productions of the fine arts of painting and ſculpture.

His lordſhip's health had long been declining; and he died a bachelor on the 22d of July 1793, lamented by his relations and friends, by his tenants and humble dependents, and by all true patriots and good men to whom his merits and virtues were known.

GARDEN, a piece of ground properly laid out, cultivated, and ornamented with a variety of plants, flowers, fruits, &c. See GARDENING.

Gardens are uſually diſtinguiſhed into flower garden, fruit garden, and kitchen garden: the firſt of which, being deſigned for pleaſure and ornament, is to be placed in the moſt conſpicuous part, that is, next to the back front of the houſe; and the two latter, being deſigned for uſe, ſhould be placed leſs in ſight. But though the fruit and kitchen gardens are here mentioned as two diſtinct gardens, yet they are now uſually in one; and that with good reaſon, ſince they both require a good ſoil and expoſure, and equally require to be placed out of the view of the houſe.

In the choice of a place proper for a garden, the moſt eſſential points to be conſidered are, the ſituation, the ſoil, the expoſure, water, and proſpect.

1ſt, As to the ſituation, it ought to be ſuch a one as

as is wholeſome, and in a place neither too high nor too low; for if a garden be too high, it will be expoſed to the winds, which are very prejudicial to trees; and if it be too low, the dampneſs, the vermine, and the venomous creatures that breed in ponds and marſhy places, add much to their inſalubrity. The moſt happy ſituation is on the ſide of a hill, eſpecially if the ſlope be eaſy, and in a manner imperceptible; if a good deal of level ground be near the houſe; and if it abounds with ſprings of water: for, being ſheltered from the fury of the winds and the violent heat of the ſun, a temperate air will be there enjoyed; and the water that deſcends from the top of the hill, either from ſprings or rain, will not only ſupply fountains, canals, and caſcades for ornament, but, when it has performed its office, will water the adjacent valleys, and, if it be not ſuffered to ſtagnate, will render them fertile and wholeſome.

2dly, A good earth or ſoil is next to be conſidered; for it is ſcarce poſſible to make a fine garden in a bad ſoil. There are indeed ways to meliorate ground, but they are very expenſive; and ſometimes, when the expence has been beſtowed of laying good earth three feet deep over the whole ſurface, a whole garden has been ruined, when the roots of the trees have come to reach the natural bottom. To judge of the quality of the ſoil, obſerve whether there be any heath, thiſtles, or ſuch like weeds, growing ſpontaneouſly in it; for they are certain ſigns that the ground is poor. Or if there be large trees growing thereabouts, obſerve whether they grow crooked, ill ſhaped, and grubby; and whether they are of a faded green, and full of moſs, or infeſted with vermine: if this be the caſe, the place is to be rejected. But, on the contrary, if it be covered with good graſs fit for paſture, you may then be encouraged to try the depth of the ſoil. To know this, dig holes in ſeveral places, ſix feet wide and four deep; and if you find three feet of good earth it will do very well, but leſs than two will not be ſufficient. The quality of good ground, is neither to be ſtony nor too hard to work; neither too dry, too moiſt, nor too ſandy and light; nor too ſtrong and clayey, which is the worſt of all for gardens.

3dly, The next requiſite is water; the want of which is one of the greateſt inconveniences that can attend a garden, and will bring a certain mortality upon whatever is planted in it, eſpecially in the greater droughts that often happen in a hot and dry ſituation in ſummer; beſides its uſefulneſs in fine gardens for making fountains, canals, caſcades, &c. which are the greateſt ornaments of a garden.

4thly, The laſt thing to be conſidered is the proſpect of a fine country; and though this is not ſo abſolutely neceſſary as water, yet it is one of the moſt agreeable beauties of a fine garden: beſides, if a garden be planted in a low place that has no kind of proſpect, it will not only be diſagreeable but unwholeſome.

In the laying out and planting of gardens, the beauties of nature ſhould always be ſtudied; for the nearer a garden approaches to nature, the longer it will pleaſe. According to Mr Miller, the area of a handſome garden may take up 30 or 40 acres, but not more; and the following rules ſhould be obſerved in the diſpoſition of it. There ought always to be a deſcent of at leaſt three ſteps from the houſe to the garden; this will render the houſe more dry and wholeſome, and the proſpect on entering the garden more extenſive.—The firſt thing that ought to preſent itſelf to view ſhould be an open lawn of graſs, which ought to be conſiderably broader than the front of the building; and if the depth be one half more than the width, it will have a better effect: if on the ſides of the lawn there are trees planted irregularly, by way of open groves, the regularity of the lawn will be broken, and the whole rendered more like nature. For the convenience of walking in damp weather, this lawn ſhould be ſurrounded with a gravel walk, on the outſide of which ſhould be borders three or four feet wide for flowers: and from the back of theſe the proſpect will be agreeably terminated by a ſlope of evergreen ſhrubs; which, however, ſhould never be ſuffered to exclude agreeable proſpects, or the view of handſome buildings. Theſe walks may lead through the different plantations, gently winding about in an eaſy natural manner; which will be more agreeable than either thoſe long ſtraight walks, too frequently ſeen in gardens, or thoſe ſerpentine windings that are twiſted about into ſo many ſhort turns as to render it difficult to walk in them; and as no garden can be pleaſing where there is a want of ſhade and ſhelter, theſe walks ſhould lead as ſoon as poſſible into plantations, where perſons may walk in private, and be ſheltered from the wind. Garden.

Narrow rivulets, if they have a conſtant ſtream, and are judiciouſly led about a garden, have a better effect than many of the large ſtagnating ponds or canals ſo frequently made in large gardens. When wilderneſſes are intended, they ſhould not be cut into ſtars and other ridiculous figures, nor formed into mazes of labyrinths, which in a great deſign appear trifling.

In ſhort, the ſeveral parts of a garden ſhould be diverſified; but in places where the eye takes in the whole at once, the two ſides ſhould be always the ſame. In the buſineſs of deſigns, the aim ſhould be always at what is natural, great, and noble. The general diſpoſition of a garden and of its parts ought to be accommodated to the different ſituations of the ground, to humour its inequalities, to proportion the number and ſorts of trees and ſhrubs to each part, and to ſhut out from the view of the garden no objects that may become ornamental. But for a more extended view of this ſubject, ſee the article GARDENING.

A practical attention to a garden, is by ſome eſteemed a degrading employment. It is true, indeed, that paſtoral and agricultural manners, if we may form a judgment from the dignified deſcriptions of Virgil, are greatly degenerated. The employments of ſhepherds and huſbandmen are now become mean and ſordid. The work of the garden is uſually left to a peaſant. Nor is it unreaſonable to aſſign the labour, which wearies without amuſement, to thoſe who are ſufficiently amuſed by the proſpect of their wages. But the operations of grafting, of inoculating, of pruning, of tranſplanting, are curious experiments in natural philoſophy; and that they are pleaſing as well as curious, thoſe can teſtify who remember what they felt on ſeeing their attempts in the amuſement of practical gardening attended with ſucceſs. Among the employments ſuitable to old age, Cicero has enumerated the ſuperintendence of a garden.

Garden. It requires no great exertion of mind or body; and its satisfactions are of that kind which pleaſe without violent agitation. Its beneficial influence on health is an additional reaſon for an attention to it at an age when infirmities abound.

In almoſt every deſcription of the ſeats of the bleſſed, ideas of a garden ſeem to have predominated. The word Paradiſe itſelf is ſynonymous with garden. The fields of Elyſium, that ſweet region of poeſy, are adorned with all that imagination can conceive to be delightful. Some of the moſt pleaſing paſſages of Milton, are thoſe in which he repreſents the happy pair engaged in cultivating their bliſsful abode. Poets have always been delighted with the beauties of a garden. Lucan is repreſented by Juvenal as repoſing in his garden. Virgil's Georgics prove him to have been captivated with rural ſcenes; though, to the ſurpriſe of his readers, he has not aſſigned a book to the ſubject of a garden. Our Shenſtone made it his ſtudy; but, with all his taſte and fondneſs for it, he was not happy in it. The captivating ſcenes which he created at the Leaſowes, afforded him, it is ſaid, little pleaſure in the abſence of ſpectators. The truth is, he made the embelliſhment of his grounds, which ſhould have been the amuſement of his life, the buſineſs of it; and involved himſelf in ſuch troubles, by the expences it occaſioned, as neceſſarily excluded tranquil enjoyment.

It is the lot of few, in compariſon, to poſſeſs territories like his, extenſive, and ſufficiently well adapted to conſtitute an ornamented farm. Still fewer are capable of ſupporting the expence of preſerving it in good condition. But let not the rich ſuppoſe they have appropriated the pleaſures of a garden. The poſſeſſor of an acre, or a ſmaller portion, may receive a real pleaſure, from obſerving the progreſs of vegetation, even in a plantation of culinary plants. A very limited tract, properly attended to, will furniſh ample employment for an individual. Nor let it be thought a mean care; for the ſame hand that raiſed the cedar, formed the hyſſop on the wall. Even the orchard, cultivated ſolely for advantage, exhibits beauties unequalled in the ſhrubbery; nor can the greenhouſe produce an appearance to exceed the bloſſom of the apple and the almond.

Hanging GARDENS, in antiquity, gardens raiſed on arches by Nebuchadnezzar king of Babylon, in order to gratify his wife Amyctis, daughter of Aſtyages king of Media. Quintus Curtius makes them equal in height to the walls of the city, viz. 50 feet. They contained a ſquare of 400 feet on every ſide, and were carried up into the air in ſeveral terraces laid above one another, and the aſcent from terrace to terrace was by ſtairs 10 feet wide. The arches ſuſtaining the whole pile were raiſed above one another, and it was ſtrengthened by a wall, ſurrounding it on every ſide, of 22 feet in thickneſs. The floors of each of the terraces were laid in the following manner; on the top of the arches were firſt laid large flat ſtones 16 feet long and 4 broad, and over them was a layer of reeds mixed with a great quantity of bitumen, over which Garden. were two rows of bricks cloſely cemented together by plaſter, and over all were laid thick ſheets of lead; and laſtly, upon the lead was laid the mould of the garden. The mould or earth was of ſuch a depth as to admit the largeſt trees to take root and grow; and it was covered with various kind of trees, plants, and flowers. In the upper terrace there was an aqueduct or engine, whereby water was drawn up out of the river for watering the whole garden.

Floating GARDENS. We are informed by the abbé Clavigero in his Hiſtory of Mexico, that when the Mexicans were brought under ſubjection to the Colhuan and Tepanecan nations, and confined to the miſerable little iſlands in the lake of Mexico, they ceaſed for ſome years to cultivate the land, becauſe they had none, until neceſſity and induſtry together taught them to form moveable fields and gardens, which floated on the waters of the lake. The method which they purſued to make theſe, and which they ſtill practiſe, is extremely ſimple. They plait and twiſt willows and roots of marſh plants or other materials together, which are light, but capable of ſupporting the earth of the garden firmly united. Upon this foundation they lay the light buſhes which float on the lake; and over all, the mud and dirt which they draw up from the bottom of the ſame lake. Their regular figure is quadrangular; their length and breadth various: but generally they are about eight perches long, and not more than three in breadth, and have leſs than a foot of elevation above the ſurface of the water. Theſe were the firſt fields which the Mexicans owned after the foundation of Mexico; there they firſt cultivated the maize, great pepper, and other plants neceſſary for their ſupport. In progreſs of time, as thoſe fields grew numerous from the induſtry of the people, there were among them gardens of flowers and odoriferous plants, which were employed in the worſhip of their gods, and ſerved for the recreation of the nobles. At preſent they cultivate flowers and every ſort of garden herbs upon them. Every day of the year, at ſunriſe, innumerable veſſels loaded with various kinds of flowers and herbs, which are cultivated in thoſe gardens, are ſeen arriving by the canals, at the great market place of that capital. All plants thrive there ſurpriſingly; the mud of the lake is an extremely fertile ſoil, and requires no water from the clouds. In the largeſt gardens there is commonly a little tree, and even a little hut to ſhelter the cultivator and defend him from rain or the ſun. When the owner of a garden, or the *Chinampa* as he is uſually called, wiſhes to change his ſituation, to remove from a diſagreeable neighbour, or to come nearer to his own family, he gets into his little veſſel, and by his own ſtrength alone, if the garden is ſmall, or with the aſſiſtance of others if it is large, he tows it after him, and conducts it wherever he pleaſes with the little tree and hut upon it. That part of the lake where thoſe floating gardens are, is a place of infinite recreation, where the ſenſes receive the higheſt poſſible gratification.

GARDENING;

THE art of planning and cultivating gardens. In its utmoſt extent, whatever contributes to render the ſcenes of nature delightful, is among the ſubjects of gardening; and animate as well as inanimate objects are circumſtances of beauty or character. The whole range of nature is open to the gardener, from the parterre to the foreſt; and whatever is agreeable to the ſenſes or the imagination, he may appropriate to the ſpot he is to improve: it is a part of his buſineſs to collect into one place the delights which are generally diſperſed through different ſpecies of country.

Hiſtory of Gardening.

† *Hiſt. of Mod. Gardening*, ſubjoined to the 4th vol. of his *Anecdotes of Painting.*

GARDENING, Mr Walpole † obſerves, was probably one of the firſt arts that ſucceeded to that of building houſes, and naturally attended property and individual poſſeſſion. Culinary, and afterwards medicinal herbs, were the objects of every head of a family: it became convenient to have them within reach, without ſeeking them at random in woods, in meadows, and on mountains, as often as they were wanted. When the earth ceaſed to furniſh ſpontaneouſly all thoſe primitive luxuries, and culture became requiſite, ſeparate incloſures for rearing herbs grew expedient. Fruits were in the ſame predicament; and thoſe moſt in uſe or that demand attention muſt have entered into and extended the domeſtic incloſure. The good man Noah, we are told, planted a vineyard, drank of the wine, and was drunken; and every body knows the conſequences. Thus we acquired kitchen gardens, orchards, and vineyards. No doubt the prototype of all theſe ſorts was the garden of Eden; but as that Paradiſe was a good deal larger than any we read of afterwards, being incloſed by the rivers Piſon, Gihon, Hiddekel, and Euphrates; as every tree that was pleaſant to the ſight and good for food grew in it; and as two other trees were likewiſe found there, of which not a ſlip or ſucker remains; it does not belong to the preſent diſcuſſion. After the fall, no man living was ſuffered to enter into the garden; and the poverty and neceſſities of our firſt anceſtors hardly allowed them time to make improvements in their eſtates in imitation of it, ſuppoſing any plan had been preſerved. A cottage and a ſlip of ground for a cabbage and a gooſeberry buſh, ſuch as we ſee by the ſide of a common, were in all probability the earlieſt ſeats and gardens: a well and bucket ſucceeded to the Piſon and Euphrates. As ſettlements increaſed, the orchard and the vineyard followed; and the earlieſt princes of tribes poſſeſſed juſt the neceſſaries of a modern farmer.

Matters, we may well believe, remained long in this ſituation; and we have reaſon to think that for many centuries the term *garden* implied no more than a kitchen garden or orchard.

The garden of Alcinous, in the Odyſſey, is the moſt renowned in the heroic times. Is there an admirer of Homer who can read his deſcription without rapture? or who does not form to his imagination a ſcene of delights more pictureſque than the landſcapes of Tinian or Juan Fernandez? "Yet (continues our author) what was that boaſted Paradiſe with which

> the gods ordain'd
> To grace Alcinous and his happy land?

Why, diveſted of harmonious Greek and bewitching poetry, it was a ſmall orchard and vineyard, with ſome beds of herbs and two fountains that watered them, encloſed within a quickſet hedge. The whole compaſs of this pompous garden encloſed—four acres:

> Four acres was th' alloted ſpace of ground,
> Fenc'd with a green encloſure all around.

The trees were apples, figs, pomegranates, pears, olives, and vines.

> Tall thriving trees confeſs'd the fruitful mold;
> The red'ning apple ripens into gold.
> Here the blue fig with luſcious juice o'erflows,
> With deeper red the full pomegranate glows;
> The branch here bends beneath the weighty pear,
> And verdant olives flouriſh round the year.
> * * * * * *
> Beds of all various herbs, for ever green,
> In beauteous order terminate the ſcene.

Alcinous's garden was planted by the poet, enriched by him with the fairy gift of eternal ſummer, and no doubt an effort of imagination ſurpaſſing any thing he had ever ſeen. As he has beſtowed on the ſame happy prince a palace with brazen walls and columns of ſilver, he certainly intended that the garden ſhould be proportionably magnificent. We are ſure, therefore, that, as late as Homer's age, an encloſure of four acres, comprehending orchard, vineyard, and kitchen garden, was a ſtretch of luxury the world at that time had never beheld."

Previous to this, however, we have in the ſacred writings hints of a garden ſtill more luxuriouſly furniſhed. We allude to the Song of Solomon, part of the ſcene of which is undoubtedly laid in a garden *. Flowers and fruits are particularly ſpoken of as the ornaments and the produce of it; and beſides theſe, aromatic vegetables formed a conſiderable part of the gratification it afforded. The camphor and the cinnamon tree, with all trees of frankincenſe, and all the chief ſpices, flouriſhed there †. Solomon tells us in another place ‡, That he made him great works;—gardens and orchards, and planted in them trees of every kind. Indeed we muſt ſuppoſe his gardens to have been both amply and curiouſly furniſhed, ſeeing the kinds, nature, and properties of the vegetable tribes, ſeem to have been a favourite ſtudy with the royal philoſopher, and to have been deemed a ſubject worthy of his pen: for we are told, that he wrote of plants, from the great cedar of Lebanon down to the hyſſop of the wall §. Fountains and ſtreams of water appear alſo to have had a ſhare in the compoſition, and probably for ornament as well as uſe.

* Chap. iv. 1.

† Cant. iv. 12.

‡ Eccl. ii. 4, 5.

§ Kings iv. 33.

The hanging gardens of Babylon, mentioned in a preceding

preceding article, were a ſtill greater prodigy. But as they are ſuppoſed to have been formed on terraces and the walls of the palace, whither ſoil was conveyed on purpoſe, Mr Walpole concludes, "they were what ſumptuous gardens have been in all ages till the preſent, unnatural, enriched by art, poſſibly with fountains, ſtatues, baluſtrades, and ſummer houſes, and were any thing but verdant and rural."

Others, however, have allowed them greater praiſe. They ſeem, in many reſpects to have been laid out with good taſte. Their elevation not only produced a variety and extent of view, but was alſo uſeful in moderating the heat. Such a ſituation would likewiſe ſuit a greater variety of trees and plants than a plain ſurface, and would contain a larger as well as a more diverſified extent.

The ſuiting of the ſituation to the nature of the trees ſeems, from the account given by Joſephus, to have been one view ‡ in the erecting the building in ſuch a manner. And the ſucceſs ſeems to have been anſwerable, as the trees are ſaid to have flouriſhed extremely well †, and to have grown as tall as in their native ſituations. On the whole, then, however different theſe may appear from modern gardens, they ſeem to have been formed with judgment and taſte, and well adapted to the ſituation and circumſtances.

‡ *Contra Apion*, lib. i. § 19.

† *Q. Curt.* lib. v.

It ſeems probable, from ſeveral circumſtances, that the eaſtern gardens were adjoining to the houſe or palace to which they belonged. Thus, King Ahaſuerus goes immediately from the banquet of wine to walk in the garden of the palace §. The garden of Cyrus, at Sardis, mentioned by Xenophon *, was probably contiguous to the palace: as was that of Attalus, mentioned by Juſtin ||. The hanging gardens at Babylon, were not ſo much adjacent to the palace, as a part of the palace itſelf, ſince ſeveral of the royal apartments were beneath them ‡.

§ Eſther vii. 7.

* *Oecon.*

|| Lib. xxxvi. c. 4

‡ *Diod.* lib. ii.

It is not clear what the taſte for gardening was among the Greeks. The Academus, we know, was a wooded ſhady place; and the trees appear to have been of the olive ſpecies. It was ſituated beyond the limits of the walls, and adjacent to the tombs of the heroes; and though we are nowhere informed of the particular manner in which this grove was diſpoſed or laid out, it may be gathered from Pauſanias, in his Attica, that it was an elegant ornamented place. At the entrance was an altar dedicated to Love, which was ſaid to be the firſt erected to that deity. Within the Academus, were the altars of Prometheus, of the Muſes, of Mercury, of Minerva, and Hercules; and at a ſmall diſtance was the tomb of Plato. So that in all probability, it was highly adapted by art, as well as nature, to philoſophic reflection and contemplation.

We are told by Plutarch, that before the time of Cimon, the Academus was a rude and uncultivated ſpot: but that it was planted by that general, and had water conveyed to it; whether this water was brought merely for uſe to refreſh the trees, or for ornament, does not appear. It was divided into gymnaſia, or places of exerciſe, and philoſophic walks, ſhaded with trees. Theſe are ſaid to have flouriſhed very well, until deſtroyed by Sylla (when he beſieged Athens), as well as thoſe in the Lyceum.

Near the academy were the gardens of the philoſophers, of Plato and of Epicurus; which, however, were probably but ſmall. The ſcene of Plato's Dialogue concerning Beauty is elegantly deſcribed as being on the banks of the river Iliſſus, and under the ſhade of the plantain; but no artificial arrangement of objects is mentioned, nor any thing which will lead us to imagine the proſpect to be any other than merely natural.

Among the Romans, a taſte of gardening, any otherwiſe than as a matter of utility, ſeems not to have prevailed till a very late period; at leaſt the writers on huſbandry, Cato, Varro, Columella, and Palladius, make not the leaſt mention of a garden as an object of pleaſure, but ſolely with reſpect to its productions of herbs and fruits. The Lucullan gardens are the firſt we find mentioned of remarkable magnificence; though probably from the extravagance to which theſe were arrived, they were not the firſt. Plutarch ſpeaks of them as incredibly expenſive, and equal to the magnificence of kings. They contained artificial elevations of ground to a ſurpriſing height, of buildings projected into the ſea, and vaſt pieces of water made upon land. In ſhort his extravagance and expence were ſo great, that he acquired thence the appellation of the Roman Xerxes. It is not improbable, from the above account, and from the conſideration of Lucullus having ſpent much time in Aſia, in a ſituation wherein he had an opportunity of obſerving the moſt ſplendid conſtructions of this kind, that theſe gardens might be laid out in the Aſiatic ſtyle. The vaſt maſſes of building ſaid to have been erected, might have borne ſome reſemblance, in the arrangement and ſtyle, to the Babylonian gardens; and the epithet of the Roman Xerxes might be applicable to the taſte, as well as to the ſize and expence of his works.

The Tuſculan villa of Cicero, though often mentioned, is not anywhere deſcribed in his works, ſo as to give an adequate idea of the ſtyle in which his gardens or grounds were diſpoſed.

There is but little to be traced in Virgil relative to this ſubject. Pines †, it ſeems probable, were a favourite ornament in gardens; and flowers §, roſes eſpecially, were much eſteemed, perfumes indeed having been always highly valued in warm climates. Virgil places Anchiſes in Elyſium, in a grove of bays: and is careful to remark, that they were of the ſweet-ſcented kind. The Pæſtan roſes were chiefly valued for their excellent odour; and the ſame quality appears to be the cauſe why they were placed by Tibullus as ornaments to the Elyſian fields. There appears alſo to have prevailed among the Romans a piece of luxury relative to gardens, which is equally prevalent at preſent among us, namely the forcing of flowers at ſeaſons of the year not ſuited to their natural blowing: and roſes were then, as at preſent, the principal flowers upon which theſe experiments were tried, as appears from Martial ‡ and others.

† *Eclog.* vii. 61, &c.

§ *Geor.* iv. 118.

When Roman authors (Mr Walpole remarks), whoſe climate inſtilled a wiſh for cool retreats, ſpeak of their enjoyments in that kind, they ſigh for grottoes, caves, and the refreſhing hollows of mountains, near ir riguous and ſhady founts; or boaſt of their porticoes, walks of planes, canals, baths, and breezes from the ſea. Their gardens are never mentioned as affording ſhade and ſhelter from the rage of the dog ſtar. Pliny has left us deſcriptions of two of his villas. As he uſed his Laurentine villa for his winter retreat, it is not ſurpriſing

‡ Vide *Epigr.* lib. vi. ep. 80. lib. xv. ep. 127. and *Lampridius in vit. Elegab.*

ſurpriſing that the garden makes no conſiderable part of the account. All he ſays of it is, that the geſtatio or place of exerciſe, which ſurrounded the garden (the latter conſequently not being very large), was bounded by a hedge of box, and, where that was periſhed, with roſemary; that there was a walk of vines; and that moſt of the trees were fig and mulberry, the ſoil not being proper for any other ſorts. On his Tuſcan villa he is more diffuſe; the garden makes a conſiderable part of the deſcription:—and what was the principal beauty of that pleaſure ground? Exactly what was the admiration of this country about threeſcore years ago; box trees cut into monſters, animals, letters, and the names of the maſter and the artificer. In an age when architecture diſplayed all its grandeur, all its purity, and all its taſte; when aroſe Veſpaſian's amphitheatre, the temple of Peace, Trajan's forum, Domitian's baths, and Adrian's villa, the ruins and veſtiges of which ſtill excite our aſtoniſhment and curioſity; a Roman conſul, a poliſhed emperor's friend, and a man of elegant literature and taſte, delighted in what the mob now ſcarce admire in a college garden. All the ingredients of Pliny's correſponded exactly with thoſe laid out by London and Wiſe on Dutch principles. He talks of ſlopes, terraces, a wilderneſs, ſhrubs methodically trimmed, a marble baſon, pipes ſpouting water, a caſcade falling into the baſon, bay trees alternately planted with planes, and a ſtraight walk from whence iſſued others parted off by hedges of box and apple trees, with obeliſks placed between every two. There wants nothing but the embroidery of a parterre, to make a garden in the reign of Trajan ſerve for a deſcription of one in that of King William. In one paſſage above, Pliny ſeems to have conceived that natural irregularity might be a beauty; *in opere urbaniſſimo*, ſays he, *ſubita velut illati ruris imitatio*. Something like a rural view was contrived amidſt ſo much poliſhed compoſition. But the idea ſoon vaniſhed, lineal walks immediately enveloped the ſlight ſcene, and names and inſcriptions in box again ſucceeded to compenſate for the daring introduction of nature.

In the paintings found at Herculaneum are a few traces of gardens, as may be ſeen in the ſecond volume of the prints. They are ſmall ſquare encloſures, formed by trellis-work and eſpaliers, and regularly ornamented with vaſes, fountains, and careatides, elegantly ſymmetrical, and proper for the narrow ſpaces allotted to the garden of a houſe in a capital city.

From what has been ſaid, it appears how naturally and inſenſibly the idea of a kitchen garden ſlid into that which has for ſo many ages been peculiarly termed a *garden*, and by our anceſtors in this country diſtinguiſhed by the name of a *pleaſure garden*. A ſquare piece of ground was originally parted off in early ages for the uſe of the family:—to exclude cattle, and aſcertain the property, it was ſeparated from the fields by a hedge. As pride and deſire of privacy increaſed, the encloſure was dignified by walls; and in climes where fruits were not laviſhed by the ripening glow of nature and ſoil, fruit trees were aſſiſted and ſheltered from ſurrounding winds by the like expedient: for the inundation of luxuries, which have ſwelled into general neceſſities, have almoſt all taken their ſource from the ſimple fountain of reaſon.

When the cuſtom of making ſquare gardens encloſed with walls was thus eſtabliſhed to the excluſion of nature and proſpect, pomp and ſolitude combined to call for ſomething that might enrich and enliven the inſipid and unanimated partition. Fountains, firſt invented for uſe, which grandeur loves to diſguiſe and throw out of the queſtion, received embelliſhments from coſtly marbles, and at laſt, to contradict utility, toſſed their waſte of waters into the air in ſpouting columns. Art, in the hands of rude man, had at firſt been made a ſuccedaneum to nature; in the hands of oſtentatious wealth, it became the means of oppoſing nature; and the more it traverſed the march of the latter, the more nobility thought its power was demonſtrated. Canals meaſured by the line were introduced in lieu of meandering ſtreams, and terraces were hoiſted aloft in oppoſition to the facile ſlopes that imperceptibly unite the valley to the hill. Baluſtrades defended theſe precipitate and dangerous elevations, and flights of ſteps rejoined them to the ſubjacent flat from which the terrace had been dug. Vaſes and ſculpture were added to theſe unneceſſary balconies, and ſtatues furniſhed the lifeleſs ſpot with mimic repreſentations of the excluded ſons of men. Thus difficulty and expence were the conſtituent parts of thoſe ſumptuous and ſelfiſh ſolitudes; and every improvement that was made, was but a ſtep farther from nature. The tricks of waterworks to wet the unwary, not to refreſh the panting ſpectator; and parterres embroidered in patterns like a petticoat, were but the childiſh endeavours of faſhion and novelty to reconcile greatneſs to what it had ſurfeited on. To crown theſe impotent diſplays of falſe taſte, the ſheers were applied to the lovely wildneſs of form with which nature has diſtinguiſhed each various ſpecies of tree and ſhrub. The venerable oak, the romantic beech, the uſeful elm, even the aſpiring circuit of the lime, the regular round of the cheſnut, and the almoſt moulded orange tree, were corrected by ſuch fantaſtic admirers of ſymmetry. The compaſs and ſquare were of more uſe in plantations than the nurſeryman. The meaſured walk, the quincunx, and the etoile, impoſed their unſatisfying ſameneſs on every royal and noble garden. Trees were headed, and their ſides pared away; many French groves ſeem green cheſts ſet upon poles. Seats of marble, arbours, and ſummer houſes, terminated every viſta; and ſymmetry, even where the ſpace was too large to permit its being remarked at one view, was ſo eſſential, that, as Pope obſerved,

——each alley has a brother,
And half the garden juſt reflects the other.

Knots of flowers were more defenſibly ſubjected to the ſame regularity. Leiſure, as Milton expreſſed it,

——in trim gardens took his pleaſure.

In the garden of Marſhal de Biron at Paris, conſiſting of 14 acres, every walk is buttoned on each ſide by lines of flower pots, which ſucceed in their ſeaſons.

It does not preciſely appear what our anceſtors meant by a bower: it was probably an arbour; ſometimes it meant the whole frittered encloſure, and in one inſtance it certainly included a labyrinth. Roſamond's bower was indiſputably of that kind; though whether compoſed of walls or hedges, we cannot determine. A ſquare and a round labyrinth were ſo capital ingredients of

of a garden formerly, that in Du Cerceau's architecture, who lived in the time of Charles IX. and Henry III. there is ſcarce a ground plot without one of each.

In Kip's Views of the Seats of our Nobility and Gentry, we ſee the ſame tireſome and returning uniformity. Every houſe is approached by two or three gardens, conſiſting perhaps of a gravel walk and two graſs plats or borders of flowers. Each riſes above the other by two or three ſteps, and as many walls and terraces, and ſo many iron gates, that we recollect thoſe ancient romances in which every entrance was guarded by nymphs or dragons. Yet though theſe and ſuch prepoſterous inconveniences prevailed from age to age, good ſenſe in this country had perceived the want of ſomething at once more grand and more natural. Theſe reflections, and the bounds ſet to the waſte made by royal ſpoilers, gave origin to Parks. They were contracted foreſts, and extended gardens. Hentzner ſays, that, according to Rous of Warwick, the firſt park was that at Woodſtock. If ſo, it might be the foundation of a legend that Henry II. ſecured his miſtreſs in a labyrinth: it was no doubt more difficult to find her in a park than in a palace, where the intricacy of the woods and various lodges buried in covert might conceal her actual habitation.

It is more extraordinary that, having ſo long ago ſtumbled on the principle of modern gardening, we ſhould have perſiſted in retaining its reverſe, ſymmetrical and unnatural gardens. That parks were rare in other countries, Hentzner, who travelled over great part of Europe, leads us to ſuppoſe, by obſerving that they were common in England. In France they retain the name, but nothing is more different both in compaſs and diſpoſition. Their parks are uſually ſquare or oblong encloſures, regularly planted with walks of cheſnuts or limes, and generally every large town has one for its public recreation.

"One man, one great man we had (continues Mr Walpole), on whom nor education nor cuſtom could impoſe their prejudices; who, 'on evil days though fallen, and with darkneſs and ſolitude compaſſed round,' judged that the miſtaken and fantaſtic ornaments he had ſeen in gardens, were unworthy of the Almighty hand that planted the delights of Paradiſe. He ſeems with the prophetic eye of taſte to have conceived, to have foreſeen modern gardening; as Lord Bacon announced the diſcoveries ſince made by experimental philoſophy. The deſcription of Eden is a warmer and more juſt picture of the preſent ſtyle than Claud Lorraine could have painted from Hagley or Stourhead. The firſt lines we ſhall quote exhibit Stourhead on a more magnificent ſcale:

> Thro' Eden went a river large,
> Nor chang'd his courſe, but thro' the ſhaggy hill,
> Paſs'd underneath ingulph'd: for God had thrown
> That mountain as his garden mound, high rais'd
> Upon the rapid current———

Hagley ſeems pictured in what follows:

> Which thro' veins
> Of porous earth with kindly thirſt updrawn,
> Roſe a freſh fountain, and with many a rill
> Water'd the garden———

What colouring, what freedom of pencil, what landſcape in theſe lines!

> ———from that ſapphire fount the criſped brooks,
> Rolling on orient pearl and ſands of gold,
> With mazy error under pendant ſhades,
> Ran nectar, viſiting each plant, and fed
> Flow'rs worthy of Paradiſe, which not *nice art*
> In beds and curious knots, but *nature boon*,
> Pour'd forth profuſe on hill, and dale, and plain,
> Both where the morning ſun firſt warmly ſmote
> The *open field*, and where the unpierc'd ſhade
> Imbrown'd the noontide bow'rs—*Thus was this place*
> *A happy rural ſeat of various view.*

Read this tranſporting deſcription, paint to your mind the ſcenes that follow, contraſt them with the ſavage but reſpectable terror with which the poet guards the bounds of his paradiſe, fenced

> ———with the champaign head
> Of a ſteep wilderneſs, whoſe hairy ſides
> With thicket overgrown, groteſque and wild,
> Acceſs denied; and over head up grew
> Inſuperable height of loftieſt ſhade,
> Cedar and pine, and fir, and branching palm,
> A ſylvan ſcene, and, as the ranks aſcend,
> Shade above ſhade, a woody theatre,
> Of ſtatelieſt view———

and then recollect, that the author of this ſublime viſion had never ſeen a glimpſe of any thing like what he has imagined; that his favourite ancients had dropped not a hint of ſuch divine ſcenery; and that the conceits in Italian gardens, and Theobalds and Nonſuch, were the brighteſt originals that his memory could furniſh. His intellectual eye ſaw a nobler plan, ſo little did he ſuffer by the loſs of ſight. It ſufficed him to have ſeen the materials with which he could work. The vigour of a boundleſs imagination told him how a plan might be diſpoſed, that would embelliſh nature, and reſtore art to its proper office, the juſt improvement or imitation of it.

"Now let us return to an admired writer, poſterior to Milton, and ſee how cold, how inſipid, how taſteleſs, is his account of what he pronounced a perfect garden. We ſpeak not of his ſtyle, which it was not neceſſary for him to animate with the colouring and glow of poetry. It is his want of ideas, of imagination, of taſte, that deſerve cenſure, when he dictated on a ſubject which is capable of all the graces that a knowledge of beautiful nature can beſtow. Sir William Temple was an excellent man; Milton, a genius of the firſt order.

"We cannot wonder that Sir William declares in favour of parterres, fountains, and ſtatues, as neceſſary to break the ſameneſs of large graſs plots, which he thinks have an ill effect upon the eye, when he acknowledges that he diſcovers fancy in the gardens of Alcinous. Milton ſtudied the ancients with equal enthuſiaſm, but no bigotry; and had judgment to diſtinguiſh between the want of invention and the beauties of poetry. Compare his paradiſe with Homer's garden, both aſcribed to a celeſtial deſign. For Sir William, it is juſt to obſerve, that his ideas centered in a fruit garden. He had the honour of giving to his country many delicate fruits,

fruits, and he thought of little elſe than diſpoſing them to the beſt advantage.

"The beſt figure of a garden (ſays he) is either a ſquare or an oblong, and either upon a flat or a deſcent: they have all their beauties, but the beſt I eſteem an oblong upon a deſcent. The beauty, the air, the view make amends for the expence, which is very great in finiſhing and ſupporting the terrace walks, in levelling the parterres, and in he ſtone ſtairs that are neceſſary from one to the other. The perfecteſt figure of a garden I ever ſaw, either at home or abroad, was that of Moor Park in Hertfordſhire, when I knew it about 30 years ago. It was made by the counteſs of Bedford, eſteemed among the greateſt wits of her time, and celebrated by Dr Donne; and with very great care, excellent contrivance, and much coſt; but greater ſums may be thrown away without effect or honour, if there want ſenſe in proportion to money, or 'if nature be not followed;' which I take to be the great rule in this, and perhaps in every thing elſe, as far as the conduct not only of our lives but our governments.' [We ſhall ſee how natural that admired garden was]. 'Becauſe I take the garden I have named to have been in all kinds the moſt beautiful and perfect, at leaſt in the figure and diſpoſition, that I ever have ſeen, I will deſcribe it for a model to thoſe that meet with ſuch a ſituation, and are above the regards of common expence. It lies on the ſide of a hill, upon which the houſe ſtands, but not very ſteep. The length of the houſe, where the beſt rooms and of moſt uſe or pleaſure are, lies upon the breadth of the garden; the great parlour opens into the middle of a terrace gravel walk that lies even with it, and which may be, as I remember, about 300 paces long, and broad in proportion; the border ſet with ſtandard laurels and at large diſtances, which have the beauty of orange trees out of flower and fruit. From this walk are three deſcents by many ſtone ſteps, in the middle and at each end, into a very large parterre. This is divided into quarters by gravel walks, and adorned with two fountains and eight ſtatues in the ſeveral quarters. At the end of the terrace walk are two ſummer houſes, and the ſides of the parterre are ranged with two large cloiſters open to the garden, upon arches of ſtone, and ending with two other ſummer houſes even with the cloiſters, which are paved with ſtone, and deſigned for walks of ſhade, there being none other in the whole parterre. Over theſe two cloiſters are two terraces covered with lead and fenced with baluſters; and the paſſage into theſe airy walks is out of the two ſummer houſes at the end of the firſt terrace walk. The cloiſter facing the ſouth is covered with vines, and would have been proper for an orange houſe, and the other for myrtles or other more common greens, and had, I doubt not, been caſt for that purpoſe, if this piece of gardening had been then in as much vogue as it is now. From the middle of this parterre is a deſcent by many ſteps flying on each ſide of a grotto, that lies between them, covered with lead and flat, into the lower garden, which is all fruit trees ranged about the ſeveral quarters of a wilderneſs, which is very ſhady; the walks here are all green, the grotto embelliſhed with figures of ſhell rock work, fountains, and water works. If the hill had not ended with the lower garden, and the wall were not bounded by a common way that goes through the park, they might have added a third quarter of all greens; but this want is ſupplied by a garden on the other ſide the houſe, which is all of that ſort, very wild, ſhady, and adorned with rough rock-work and fountains. This was Moor Park when I was acquainted with it, and the ſweeteſt place, I think, that I have ſeen in my life, either before or ſince, at home or abroad.'

"It is unneceſſary to add any remarks on this deſcription. Any man might deſign and build as ſweet a garden, who had been born in and never ſtirred out of Holborn. It was not, however, peculiar to Sir William Temple to think in that manner. How many Frenchmen are there who have ſeen our gardens, and ſtill prefer natural flights of ſteps and ſhady cloiſters covered with lead! Le Nautre, the architect of the groves and grottoes at Verſailles, came hither on a miſſion to improve our taſte. He planted St James's and Greenwich Parks—no great monuments of his invention.

"To do farther juſtice to Sir William Temple, we muſt not omit what he adds. 'What I have ſaid of the beſt forms of gardens is meant only of ſuch as are in ſome ſort regular; for there may be other forms wholly irregular, that may, for ought I know, have more beauty than any of the others: but they muſt owe it to ſome extraordinary diſpoſitions of nature in the ſeat, or ſome great race of fancy or judgment in the contrivance, which may reduce many diſagreeing parts into ſome figure, which ſhall yet, upon the whole, be very agreeable. Something of this I have ſeen in ſome places, but heard more of it from others who have lived much among the Chineſes, a people whoſe way of thinking ſeems to lie as wide of ours in Europe as their country does. Their greateſt reach of imagination is employed in contriving figures, where the beauty ſhall be great and ſtrike the eye, but without any order or diſpoſition of parts, that ſhall be commonly or eaſily obſerved. And though we have hardly any notion of this ſort of beauty, yet they have a particular word to expreſs it: and when they find it hit their eye at firſt ſight, they ſay the Sharawadgi is fine or is admirable, or any ſuch expreſſion of eſteem: but I ſhould hardly adviſe any of theſe attempts in the figure of gardens among us; they are adventures of too hard achievement for any common hands; and though there may be more honour if they ſucceed well, yet there is more diſhonour if they fail, and it is twenty to one they will; whereas in regular figures it is hard to make any great and remarkable faults.'

"Fortunately Kent and a few others were not quite ſo timid, or we might ſtill be going up and down ſtairs in the open air. It is true, we have heard much lately, as Sir William Temple did, of irregularity and imitations of nature in the gardens or grounds of the Chineſe. The former is certainly true: they are as whimſically irregular, as European gardens are formally uniform and unvaried:—but with regard to nature, it ſeems as much avoided, as in the ſquares and oblongs and ſtraight lines of our anceſtors. An artificial perpendicular rock ſtarting out of a flat plain, and connected with nothing, often pierced through in various places with oval hollows, has no more pretenſion to be deemed natural than a lineal terrace or a parterre. The late Mr Joſeph Spence, who had both taſte and zeal

for the preſent ſtyle, was ſo perſuaded of the Chineſe emperor's pleaſure ground being laid out on principles reſembling ours, that he tranſlated and publiſhed, under the name of Sir Harry Beaumont, a particular account of that encloſure from the collection of the letters of the Jeſuits. But except a determined irregularity, one can find nothing in it that gives any idea of attention being paid to nature. It is of vaſt circumference, and contains 200 palaces, beſides as many contiguous for the eunuchs, all gilt, painted, and varniſhed. There are raiſed hills from 20 to 60 feet high, ſtreams and lakes, and one of the latter five miles round. Theſe waters are paſſed by bridges:—but even their bridges muſt not be ſtraight—they ſerpentize as much as the rivulets, and are ſometimes ſo long as to be furniſhed with reſting places, and begin and end with triumphal arches. The colonnades undulate in the ſame manner. In ſhort, this pretty gaudy ſcene is the work of caprice and whim, and, when we reflect on their buildings, preſents no image but that of unſubſtantial tawdrineſs. Nor is this all. Within this fantaſtic paradiſe is a ſquare town, each ſide a mile long. Here the eunuchs of the court, to entertain his imperial majeſty with the buſtle and buſineſs of the capital in which he reſides, but which it is not of his dignity ever to ſee, act merchants and all ſorts of trades, and even deſignedly exerciſe for his royal amuſement every art of knavery that is practiſed under his auſpicious government. Methinks this is the childiſh ſolace and repoſe of grandeur, not a retirement from affairs to the delights of rural life. Here too his majeſty plays at agriculture: there is a quarter ſet a part for that purpoſe; the eunuchs ſow, reap, and carry in their harveſt, in the imperial preſence; and his majeſty returns to Pekin, perſuaded that he has been in the country.

"Having thus cleared our way by aſcertaining what have been the ideas on gardening in all ages as far as we have materials to judge by, it remains to ſhow to what degree Mr Kent invented the new ſtyle, and what hints he had received to ſuggeſt and conduct his undertaking.

"We have ſeen what Moor Park was, when pronounced a ſtandard. But as no ſucceeding generation in an opulent and luxurious country contents itſelf with the perfection eſtabliſhed by its anceſtors, more perfect perfection was ſtill ſought; and improvements had gone on, till London and Wiſe had ſtocked all our gardens with giants, animals, monſters, coats of arms, and mottoes, in yew, box, and holly. Abſurdity could go no farther, and the tide turned. Bridgman, the next faſhionable deſigner of gardens, was far more chaſte; and whether from good ſenſe, or that the nation had been ſtruck and reformed by the admirable paper in the Guardian, N° 173. he baniſhed verdant ſculpture, and did not even revert to the ſquare preciſion of the foregoing age. He enlarged his plans, diſdained to make every diviſion tally to its oppoſite; and though he ſtill adhered much to ſtraight walks with high clipped hedges, they were only his great lines; the reſt he diverſified by wilderneſs, and with looſe groves of oak, though ſtill within ſurrounding hedges. As his reformation gained footing, he ventured, in the royal garden at Richmond, to introduce cultivated fields, and even morſels of a foreſt appearance, by the ſides of thoſe endleſs and tireſome walks that ſtretched out of one into another without intermiſſion. But this was not till other innovators had broke looſe too from rigid ſymmetry.

"But the capital ſtroke, the leading ſtep to all that has followed, was the deſtruction of walls for boundaries, and the invention of foſſes—an attempt then deemed ſo aſtoniſhing, that the common people called them Ha! Ha's! to expreſs their ſurpriſe at finding a ſudden and unperceived check to their walk.

"A ſunk fence may be called the *leading ſtep*, for theſe reaſons. No ſooner was this ſimple enchantment made, than levelling, mowing, and rolling, followed. The contiguous ground of the park without the ſunk fence was to be harmonized with the lawn within; and the garden in its turn was to be ſet free from its prime regularity, that it might aſſort with the wilder country without. The ſunk fence aſcertained the ſpecific garden; but that it might not draw too obvious a line of diſtinction between the neat and the rude, the contiguous out-lying parts came to be included in a kind of general deſign; and when nature was taken into the plan, under improvements, every ſtep that was made pointed out new beauties, and inſpired new ideas. At that moment appeared Kent, painter enough to taſte the charms of landſcape, bold, and opinionative enough to dare and to dictate, and born with a genius to ſtrike out a great ſyſtem from the twilight of imperfect eſſays. He leaped the fence, and ſaw that all nature was a garden. He felt the delicious contraſt of hill and valley changing imperceptibly into each other, taſted the beauty of the gentle ſwell or concave ſcoop, and remarked how looſe groves crowned an eaſy eminence with happy ornament; and while they called in the diſtant view between their graceful ſtems, removed and extended the perſpective by deluſive compariſon.

"Thus the pencil of his imagination beſtowed all the arts of landſcape on the ſcenes he handled. The great principles on which he worked were perſpective, and light and ſhade. Groups of trees broke too uniform or too extenſive a lawn; evergreens and woods were oppoſed to the glare of the champaign; and where the view was leſs fortunate, or ſo much expoſed as to be beheld at once, he blotted out ſome parts by thick ſhades, to divide it into variety, or to make the richeſt ſcene more enchanting by reſerving it to a farther advance of the ſpectator's ſtep. Thus, ſelecting favourite objects, and veiling deformities by ſcreens of plantation; ſometimes allowing the rudeſt waſte to add its foil to the richeſt theatre; he realized the compoſitions of the greateſt maſters in painting. Where objects were wanting to animate his horizon, his taſte as an architect could beſtow immediate termination. His buildings, his ſeats, his temples, were more the works of his pencil than of his compaſſes. We owe the reſtoration of Greece and the diffuſion of architecture to his ſkill in landſcape.

"But of all the beauties he added to the face of this beautiful country, none ſurpaſſed his management of water. Adieu to canals, circular baſons, and caſcades tumbling down marble ſteps, that laſt abſurd magnificence of Italian and French villas. The forced elevation of cataracts was no more. The gentle ſtream was taught to ſerpentize ſeemingly at its pleaſure; and

where

where diſcontinued by different levels, its courſe appeared to be concealed by thickets properly interſperſed, and glittered again at a diſtance, where it might be ſuppoſed naturally to arrive. Its borders were ſmoothed, but preſerved their waving irregularity. A few trees ſcattered here and there on its edges ſprinkled the tame bank that accompanied its meanders; and when it diſappeared among the hills, ſhades deſcending from the heights leaned towards its progreſs, and framed the diſtant point of light under which it was loſt, as it turned aſide to either hand of the blue horizon.

"Thus, dealing in none but the colours of nature, and catching its moſt favourable features, men ſaw a new creation opening before their eyes. The living landſcape was chaſtened or poliſhed, not transformed. Freedom was given to the forms of trees: they extended their branches unreſtricted; and where any eminent oak, or maſter beech, had eſcaped maiming and ſurvived the foreſt, buſh and bramble was removed, and all its honours were reſtored to diſtinguiſh and ſhade the plain. Where the united plumage of an ancient wood extended wide its undulating canopy, and ſtood venerable in its darkneſs, Kent thinned the foremoſt ranks, and left but ſo many detached and ſcattered trees, as ſoftened the approach of gloom, and blended a chequered light with the thus lengthened ſhadows of the remaining columns.

"Succeeding artiſts have added new maſter ſtrokes to theſe touches; perhaps improved or brought to perfection ſome that have been named. The introduction of foreign trees and plants, which we owe principally to Archibald duke of Argyle, contributed eſſentially to the richneſs of colouring ſo peculiar to our modern landſcape. The mixture of various greens, the contraſt of forms between our foreſt trees and the northern and Weſt Indian firs and pines, are improvements more recent than Kent, or but little known to him. The weeping willow, and every florid ſhrub, each tree of delicate or bold leaf, are new tints in the compoſition of our gardens.

"But juſt as the encomiums are that have been beſtowed on Kent's diſcoveries, he was neither without aſſiſtance or faults. Mr Pope undoubtedly contributed to form his taſte. The deſign of the prince of Wales's garden at Carlton houſe was evidently borrowed from the poet's at Twickenham. There was a little of affected modeſty in the latter, when he ſaid, of all his works he was moſt proud of his garden. And yet it was a ſingular effort of art and taſte to impreſs ſo much variety and ſcenery on a ſpot of five acres. The paſſing through the gloom from the grotto to the opening day, the retiring and again aſſembling ſhades, the duſky groves, the larger lawn, and the ſolemnity of the termination at the cypreſſes that lead up to his mother's tomb, are managed with exquiſite judgment; and though Lord Peterborough aſſiſted him

To form his quincunx and to rank his vines,

thoſe were not the moſt pleaſing ingredients of his little perſpective.

"Having routed profeſſed art (for the modern gardener exerts his talents to conceal his art), Kent, like other reformers, knew not how to ſtop at the juſt limits. He had followed Nature, and imitated her ſo happily, that he began to think all her works were equally proper for imitation. In Kenſington garden he planted dead trees to give a greater air of truth to the ſcene—but he was ſoon laughed out of this exceſs. His ruling principle was, that nature abhors a ſtraight line. His mimics (for every genius has his apes), ſeemed to think that ſhe could love nothing but what was crooked. Yet ſo many men of taſte of all ranks devoted themſelves to the new improvements, that it is ſurpriſing how much beauty has been ſtruck out, with how few abſurdities. Still in ſome lights the reformation ſeems to have been puſhed too far. Though an avenue croſſing a park or ſeparating a lawn, and intercepting views from the ſeat to which it leads, are capital faults; yet a great avenue cut through woods, perhaps before entering a park, has a noble air, and,

Like footmen running before coaches
To tell the inn what lord approaches,

announces the habitation of ſome man of diſtinction. In other places the total baniſhment of all particular neatneſs immediately about a houſe, which is frequently left gazing by itſelf in the middle of a park, is a defect. Sheltered and even cloſe walks, in ſo very uncertain a climate as ours, are comforts ill exchanged for the few pictureſque days that we enjoy; and whenever a family can purloin a warm and even ſomething of an old-faſhioned garden from the landſcape deſigned for them by the undertaker in faſhion, without interfering with the picture, they will find ſatisfactions in thoſe days that do not invite ſtrangers to come and ſee their improvements."

PART I. PRINCIPLES OF GARDENING.

GARDENING, in the perfection to which it has been lately brought in Britain, is entitled to a place of conſiderable rank among the liberal arts. It is (ſays Mr Wheatley) as ſuperior to landſcape painting as a reality to a repreſentation: it is an exertion of fancy; a ſubject for taſte; and being releaſed now from the reſtraints of regularity, and enlarged beyond the purpoſes of domeſtic convenience, the moſt beautiful, the moſt ſimple, the moſt noble ſcenes of nature, are all within its province. For it is no longer confined to the ſpots from which it takes its name; but, as already obſerved, regulates alſo the diſpoſition and embelliſhment of a park, a farm, a foreſt, &c.: and the buſineſs of a gardener is to ſelect and apply whatever is great, elegant, or characteriſtic in any of them; to diſcover, and to ſhow all the advantages of the place upon which he is employed; to ſupply its defects, to correct its faults, and to improve its beauties.

Ground, Wood.

Sect. I. *Materials of Gardening.*

These may be divided into two general classes; *Natural* and *Factitious*.

§ 1. *Of the Natural Materials.*

These, according to Mr Wheatley's enumeration, are—Ground, Wood, Water, and Rocks.

I. GROUND. By this is meant that portion of naked surface which is included within the place to be improved; whether that surface be swamp, lawn, roughet, or broken ground; and whether it be a height, a valley, a plain, or a composition of swells, dips, and levels.

The following passage has been quoted from Mr Gilpin's observations on the Wye *, as affording a sublime idea of what ground ought to be.—"Nothing (says he) gives so just an idea of the beautiful swellings of ground as those of water, where it has sufficient room to undulate and expand. In ground which is composed of very refractory materials, you are presented often with harsh lines, angular insertions, and disagreeable abruptnesses. In water, whether in gentle or in agitated motion, all is easy, all is softened into itself; and the hills and valleys play into each other in a variety of the most beautiful forms. In agitated water, abruptnesses indeed there are, but yet they are such abruptnesses as in some part or other unite properly with the surface around them; and are on the whole peculiarly harmonious. Now, if the ocean in any of these swellings and agitations could be arrested and fixed, it would produce that pleasing variety which we admire in ground. Hence it is common to fetch our images from water, and apply them to land: we talk of an undulating line, a playing lawn, and a billowy surface; and give a much stronger and more adequate idea by such imagery, than plain language could possibly present."

* Page 62.

The exertions of art, however, are here inadequate; and the artist ought not to attempt to create a mountain, a valley, or a plain: he should but rarely meddle even with the smaller inequalities of grounds. Roughets and broken ground may generally be reduced to lawn, or hid with wood; and a swamp may be drained or covered with water; whilst lawn may be variegated at pleasure by wood, and sometimes by water.

II. WOOD, as a general term, comprehends all trees and shrubs in whatever disposition; but it is specifically applied in a more limited sense, and in that sense we shall now use it.

Every plantation must be either a *wood*, a *grove*, or *clump*. A wood is composed both of trees and underwood, covering a considerable space. A grove consists of trees without underwood. A clump differs from either only in extent: it may be either close or open; when close, it is sometimes called a *thicket;* when open, a *group of trees;* but both are equally clumps, whatever may be the shape or situation.

Wood.

1 Of the surface of a wood.

1. One of the noblest objects in nature (Mr Wheatley observes) is the *surface of a large thick wood*, commanded from an eminence, or seen from below hanging on the side of a hill. The latter is generally the more interesting object. Its aspiring situation gives it an air of greatness; its termination is commonly the horizon; and, indeed, if it is deprived of that splendid boundary if the brow appears above it (unless some very peculiar effect characterises that brow), it loses much of its magnificence: it is inferior to a wood which covers a less hill from the top to the bottom; for a whole space filled is seldom little. But a wood commanded from an eminence is generally no more than a part of the scene below; and its boundary is often inadequate to its greatness. To continue it, therefore, till it winds out of sight, or loses itself in the horizon, is generally desirable: but then the varieties of its surface grow confused as it retires; while those of a hanging wood are all distinct, the furthest parts are held up to the eye, and none are at a distance though the whole be extensive.

The varieties of a surface are essential to the beauty of it: a continued smooth shaven level of foliage is neither agreeable nor natural; the different growths of trees commonly break it in reality, and their shadows still more in appearance. These shades are so many tints, which, undulating about the surface, are its greatest embellishment; and such tints may be produced with more effect, and more certainty, by a judicious mixture of greens; at the same time an additional variety may be introduced, by grouping and contrasting trees very different in shape from each other; and whether variety in the greens or in the forms be the design, the execution is often easy, and seldom to a certain degree impossible. In raising a young wood, it may be perfect. In old woods, there are many spots which may be either thinned or thickened: and there the characteristic distinctions should determine what to plant, or which to leave; at the least will often point out those which, as blemishes, ought to be taken away; and the removal of two or three trees will sometimes accomplish the design. The number of beautiful forms and agreeable masses, which may decorate the surface, is so great, that where the place will not admit of one, another is always ready; and as no delicacy of finishing is required, no minute exactness is worth regarding; great effects will not be disconcerted by small obstructions and little disappointments.

The contrasts, however, of masses and of groups must not be too strong, where *greatness* is the character of the wood; for unity is essential to greatness: and if direct opposites be placed close together, the wood is no longer one object; it is only a confused collection of several separate plantations. But if the progress be gradual from the one to the other, shapes and tints widely different may assemble on the same surface; and each should occupy a considerable space: a single tree, or a small cluster of trees, in the midst of an extensive wood, is in size but a speck, and in colour but a spot; the groups and the masses must be large to produce any sensible variety.

When, in a romantic situation, very broken ground is overspread with wood, it may be proper on the surface of the wood to mark the inequalities of the ground. *Rudeness*, not greatness, is the prevailing idea; and a choice directly the reverse of that which is productive of unity will produce it. Strong contrasts, even oppositions,

Wood. fitions, may be eligible; the aim is rather to disjoin than to connect: a deep hollow may sink into dark greens; an abrupt bank may be shewn by a rising stage of aspiring trees, a sharp ridge by a narrow line of conical shapes: firs are of great use upon such occasions; their tint, their form, their singularity, recommend them.

A hanging *wood of thin forest trees*, and seen from below is seldom pleasing: these few trees are by the perspective brought nearer together; it loses the beauty of a thin wood, and is defective as a thick one: the most obvious improvement, therefore is to thicken it. But, when seen from an eminence, a thin wood is often a lively and elegant circumstance in a view; it is full of objects; and every separate tree shows its beauty. To increase that vivacity which is the peculiar excellence of a thin wood, the trees should be characteristically distinguished both in their tints and their shapes; and such as for their airiness have been proscribed in a thick wood, are frequently the most eligible here. Differences also in their growths are a farther source of variety; each should be considered as a distinct object, unless where a small number are grouped together; and then all that compose the little cluster must agree: but the groups themselves, for the same reason as the separate trees, should be strongly contrasted; the continued underwood is their only connexion, and that is not affected by their variety.

2 Of the outline of a wood. Though the surface of a wood, when commanded, deserves all these attentions, yet the *outline* more frequently calls for our regard: it is also more in our power; it may sometimes be great, and may always be beautiful. The first requisite is irregularity. That a mixture of trees and underwood should form a long straight line, can never be natural; and a succession of easy sweeps and gentle rounds, each a portion of a greater or less circle, composing all together a line literally serpentine, is, if possible, worse. It is but a number of regularities put together in a disorderly manner, and equally distant from the beautiful both of art and of nature. The true beauty of an outline consists more in breaks than in sweeps; rather in angles than in rounds; in variety, not in succession.

Every variety in the outline of a wood must be a *prominence* or a *recess*. Breadth in either is not so important as length to the one and depth to the other. If the former ends in an angle, the latter diminishes to a point; they have more force than a shallow dent, or a dwarf excrescence, how wide soever. They are greater deviations from the continued line which they are intended to break; and their effect is to enlarge the wood itself, which seems to stretch from the most advanced point, back beyond the most distant to which it retires. The extent of a large wood on a flat, not commanded, can by no circumstance be so manifestly shewn as by a deep recess; especially if that recess wind so as to conceal the extremity, and leave the imagination to pursue it. On the other hand, the poverty of a shallow wood might sometimes be relieved by here and there a prominence, or clumps which by their apparent junction should seem to be prominences from it. A deeper wood with a continued outline, except when commanded, would not appear so considerable.

An inlet into a wood seems to have been cut, if the opposite points of the entrance tally; and that show of art depreciates its merit: but a difference only in the situation of those points, by bringing one more forward than the other, prevents the appearance, though their forms be similar. Other points, which distinguish the great parts, should in general be strongly marked: a short turn has more spirit in it than a tedious circuity; and a line broken by angles has a precision and firmness, which in an undulated line are wanting; the angles should indeed commonly be a little softened; the rotundity of the plant which forms them is sometimes sufficient for the purpose; but if they are mellowed down too much, they lose all meaning. Three or four large parts thus boldly distinguished, will break a very long outline. When two woods are opposed on the sides of a narrow glade, neither has so much occasion for variety in itself as if it were single; if they are very different from each other, the contrast supplies the deficiency to each, and the interval between them is full of variety. The form of that interval is indeed of as much consequence as their own: though the outlines of both the woods be separately beautiful, yet if together they do not cast the open space into an agreeable figure, the whole scene is not pleasing; and a figure is never agreeable, when the sides too closely correspond: whether they are exactly the same, or exactly the reverse of each other, they equally appear artificial.

Wood. *Wheatley's Observat. on Modern Gardening.*

Every variety of outline hitherto mentioned may be traced by the underwood alone; but frequently the same effects may be produced with more ease, and with much more beauty, by a few trees standing out from the thicket, and belonging, or seeming to belong, to the wood, so as to make a part of its figure. Even where they are not wanted for that purpose, detached trees are such agreeable objects, so distinct, so light, when compared to the covert about them, that skirting along it in some parts, and breaking it in others, they give an unaffected grace, which can no otherwise be given to the outline. They have a still further effect, when they stretch across the whole breadth of an inlet, or before part of a recess into the wood; they are themselves shown to advantage by the space behind them; and that space, seen between their stems, they in return throw into an agreeable perspective.

3 Of a grove.

2. The prevailing character of a wood is generally grandeur: the principal attention therefore which it requires, is to prevent the excesses of that character, to diversify the uniformity of its extent, to lighten the unwieldiness of its bulk, and to blend graces with greatness. The character of a *grove* is beauty. Fine trees are lovely objects: a grove is an assemblage of them; in which every individual retains much of its own peculiar elegance, and whatever it loses is transferred to the superior beauty of the whole. To a grove, therefore, which admits of endless variety in the disposition of the trees, differences in their shapes and their greens are seldom very important, and sometimes they are detrimental. Strong contrasts scatter trees which are thinly planted, and which have not the connection of underwood; they no longer form one plantation; they are a number of single trees. A thick grove is not indeed exposed to this mischief, and certain situations may recommend different shapes and different greens for their effects upon the surface; but in the outline they are seldom much regarded. The eye attracted into the depth

of.

Wood. Ibid. of the grove, paſſes by little circumſtances at the entrance; even varieties in the form of the line do not always engage the attention; they are not ſo apparent as in a continued thicket, and are ſcarcely ſeen if they are not conſiderable.

But the ſurface and the outline are not the only circumſtances to be attended to. Though a grove be beautiful as an object, it is beſides delightful as a ſpot to walk or to ſit in; and the choice and the diſpoſition of the trees for effects within, are therefore a principal conſideration. Mere irregularity alone will not pleaſe: ſtrict order is there more agreeable than abſolute confuſion; and ſome meaning better than none. A regular plantation has a degree of beauty; but it gives no ſatisfaction, becauſe we know that the ſame number of trees might be more beautifully arranged. A diſpoſition, however, in which the lines only are broken, without varying the diſtances, is equally improper. The trees ſhould gather into groups, or ſtand in various irregular lines, and deſcribe various figures: the intervals between them ſhould be contraſted both in ſhape and in dimenſions: a large ſpace ſhould in ſome places be quite open; in others the trees ſhould be ſo cloſe together, as hardly to leave a paſſage between them; and in others as far apart as the connexion will allow. In the forms and the varieties of theſe groups, theſe lines, and theſe openings, principally conſiſts the interior beauty of a grove.

† New Eſher in Surry. The force of them is moſt ſtrongly illuſtrated at Claremont†, where the walk to the cottage, though deſtitute of many natural advantages, and eminent for none; though it commands no proſpect; though the water below it is a trifling pond; though it has nothing, in ſhort, but inequality of ground to recommend it; is yet the fineſt part of the garden: for a grove is there planted in a gently curved direction, all along the ſide of a hill, and on the edge of a wood, which riſes above it. Large receſſes break it into ſeveral clumps, which hang down the declivity: ſome of them approaching, but none reaching quite to the bottom. Theſe receſſes are ſo deep as to form great openings in the midſt of the grove; they penetrate almoſt to the covert: but the clumps being all equally ſuſpended from the wood; and a line of open plantation, though ſometimes narrow, running conſtantly along the top; a continuation of grove is preſerved, and the connexion between the parts is never broken. Even a group, which near one of the extremities ſtands out quite detached, is ſtill in ſtyle ſo ſimilar to the reſt as not to loſe all relation. Each of theſe clumps is compoſed of ſeveral others ſtill more intimately united; each is full of groups, ſometimes of no more than two trees, ſometimes of four or five, and now and then in larger cluſters; an irregular waving line, iſſuing from ſome little crowd, loſes itſelf in the next; or a few ſcattered trees drop in a more diſtant ſucceſſion from the one to the other. The intervals, winding here like a glade, and widening there into broader openings, differ in extent, in figure, and direction; but all the groups, the lines, and the intervals, are collected together into large general clumps, each of which is at the ſame time both compact and free, identical and various. The whole is a place wherein to tarry with ſecure delight, or ſaunter with perpetual amuſement.

The grove at Eſher place was planted by the ſame maſterly hand; but the neceſſity of accommodating the young plantation to ſome large trees which grew there before, has confined its variety. The groups are few and ſmall: there was not room for larger or for more; there were no opportunities to form continued narrow glades between oppoſite lines; the vacant ſpaces are therefore chiefly irregular openings, ſpreading every way, and great differences of diſtance between the trees are the principal variety; but the grove winds along the bank of a large river, on the ſide and at the foot of a very ſudden aſcent, the upper part of which is covered with wood. In one place, it preſſes cloſe to the covert; retires from it in another; and ſtretches in a third acroſs a bold receſs, which runs up high into the thicket. The trees ſometimes overſpread the flat below; ſometimes leave an open ſpace to the river; at other times crown the brow of a large knoll, climb up a ſteep, or hang on a gentle declivity. Theſe varieties in the ſituation more than compenſate for the want of variety in the diſpoſition of the trees; and the many happy circumſtances which concur,

Wood.

> ——In Eſher's peaceful grove,
> Where Kent and nature vie for Pelham's love,

render this little ſpot more agreeable than any at Claremont. But though it was right to preſerve the trees already ſtanding, and not to ſacrifice great preſent beauties to ſtill greater in futurity; yet this attention has been a reſtraint; and the grove at Claremont, conſidered merely as a plantation, is in delicacy of taſte, and fertility of invention, ſuperior to that at Eſher.

It is, however, poſſible to ſecure both a preſent and a future effect, by fixing firſt on a diſpoſition which will be beautiful when the trees are large, and then intermingling another which is agreeable while they are ſmall. Theſe occaſional trees are hereafter to be taken away; and muſt be removed in time, before they become prejudicial to the others.

The conſequence of variety in the diſpoſition, is variety in the light and ſhade of the grove; which may be improved by the choice of the trees. Some are impenetrable to the fierceſt ſunbeam; others let in here and there a ray between the large maſſes of their foliage; and others, thin both of boughs and of leaves, only chequer the around. Every degree of light and ſhade, from a glare to obſcurity, may be managed, partly by the number, and partly by the texture, of the trees. Differences only in the manner of their growths have alſo correſponding effects: there is a cloſeneſs under thoſe whoſe branches deſcend low, and ſpread wide; a ſpace and liberty where the arch above is high; and frequent tranſitions from the one to the other are very pleaſing. Theſe ſtill are not all the varieties of which the interior of a grove is capable; trees, indeed, whoſe branches nearly reach the ground, being each a ſort of thicket, are inconſiſtent with an open plantation: but though ſome of the characteriſtic diſtinctions are thereby excluded, other varieties more minute ſucceed in their place; for the freedom of paſſage throughout brings every tree in its turn near to the eye, and ſubjects even differences in foliage to obſervation. Theſe, ſlight as they may ſeem, are agreeable when they occur; it is true, they are not regretted when wanting; but a defect of ornament is not neceſſarily a bleminſh.

4 Of Clumps.

3. It has been already obſerved, that *clumps* differ only

Wood. Ibid.

only in extent from woods, if they are close; or from groves, if they are open: they are small woods, and small groves, governed by the same principles as the larger, after allowances made for their dimensions. But besides the properties they may have in common with woods or with groves, they have others peculiar to themselves which require examination.

They are either *independent* or *relative*: when independent, their beauty, as single objects, is solely to be attended to; when relative, the beauty of the individuals must be sacrificed to the effect of the whole, which is the greater consideration.

The *occasions* on which independent clumps may be applied, are many. They are often desirable as beautiful objects in themselves; they are sometimes necessary to break an extent of lawn, or a continued line whether of ground or of plantation; but on all occasions a jealousy of art constantly attends them, which irregularity in their figure will not always alone remove. Though elevations show them to advantage, yet a hillock evidently thrown up on purpose to be crowned with a clump, is artificial to a degree of disgust: some of the trees should therefore be planted on the sides, to take off that appearance. The same expedient may be applied to clumps placed on the brow of a hill, to interrupt its sameness: they will have less ostentation of design, if they are in part carried down either declivity. The objection already made to planting many along such a brow, is on the same principle: a single clump is less suspected of art; if it be an open one, there can be no finer situation for it, than just at the point of an abrupt hill, or on a promontory into a lake or a river. It is in either a beautiful termination, distinct by its position, and enlivened by an expanse of sky or of water about and beyond it. Such advantages may balance little defects in its form: but they are lost if other clumps are planted near it; art then intrudes, and the whole is displeasing.

But though a multiplicity of clumps, when each is an independent object, seldom seems natural; yet a number of them may, without any appearance of art, be admitted into the same scene, if they bear a *relation* to each other: if by their succession they diversify a continued outline of wood, if between them they form beautiful glades, if altogether, they cast an extensive lawn into an agreeable shape, the *effect* prevents any scrutiny into the means of producing it. But when the reliance on that effect is so great, every other consideration must give way to the beauty of the whole. The figure of the glade, of the lawn, or of the wood, are principally to be attended to: the finest clumps, if they do not fall easily into the great lines, are blemishes; their connexions, their contrasts, are more important than their forms.

5 a Lake

III. WATER. All inland water is either *running* or *stagnated*. When stagnated, it forms a *lake* or a *pool*, which differ only in extent; and a *pool* and a *pond* are the same. Running waters are either a *rivulet*, a *river*, or a *rill*; and these differ only in breadth: a *rivulet* and a *brook* are synonymous terms; a *stream* and a *current* are general names for all.

1. Space or expansion is essential to a *lake*. It cannot be too large as a subject of description or of contemplation; but the eye receives little satisfaction when it has not a form on which to rest: the ocean itself hardly atones by all its grandeur for its infinity; and a prospect of it is, therefore, always most agreeable, when in some part, at no great distance, a reach of shore, a promontory, or an island, reduces the immensity into shape. An artificial lake, again, may be comparatively extravagant in its dimensions. It may be so out of proportion to its appendages, as to seem a waste of water; for all size is in some respects relative: if this exceeds its due dimensions, and if a flatness of shore beyond it, adds still to the dreariness of the scene; wood to raise the banks, and objects to distinguish them, are the remedies to be employed. If the length of a piece of water be too great for its breadth, so as to destroy all idea of circuity, the extremities should be considered as too far off, and made important to give them proximity; while at the same time the breadth may be favoured, by keeping down the banks on the sides. On the same principle, if the lake be too small, a low shore will, in appearance, increase the extent.

Water.

But it is not necessary that the whole scene be bounded: if form be impressed on a considerable part, the eye can, without disgust, permit a large reach to stretch beyond its ken; it can even be pleased to observe a tremulous motion in the horizon, which shows that the water has not there yet attained its termination. Still short of this, the extent may be kept in uncertainty; a hill or a wood may conceal one of the extremities, and the country beyond it, in such a manner as to leave room for the supposed continuation of so large a body of water. Opportunities to choose this shape are frequent, and it is the most perfect of any: the scene is closed, but the extent of the lake is undetermined; a complete form is exhibited to the eye, while a boundless range is left open to the imagination.

But mere form will only give content, not delight: that depends upon the outline, which is capable of exquisite beauty; and the *bays*, the *creeks*, and the *promontories*, which are ordinary parts of that outline, together with the accidents of *islands*, of *inlets*, and of *outlets* to rivers, are in their shapes and their combinations an inexhaustible fund of variety.

Bays, creeks, and promontories, however, thoug extremely beautiful, should not be very numerous: for a shore broken into little points and hollows has no certainty of outline; it is only ragged, not diversified; and the distinctness and simplicity of the great parts are hurt by the multiplicity of subdivisions. But islands, though the channels between them be narrow, do not so often derogate from greatness: they intimate a space beyond them whole boundaries do not appear; and remove to a distance the shore which is seen in perspective between them. Such partial interruptions of the sight suggest ideas of extent to the imagination.

6 Of a River.

2. Though the windings of a *river* are proverbially descriptive of its course; yet without being perpetually wreathed, it may be natural. Nor is the character expressed only by the turnings. On the contrary, if they are too frequent and sudden, the current is reduced into a number of separate pools, and the idea of progress is obscured by the difficulty of tracing it. Length is the strongest symptom of continuation:

long

Water. long reaches are therefore characteriſtic of a river, and they conduce much to its beauty; each is a conſiderable piece of water, and variety of beautiful forms may be given to their outlines.

Ibid. A river requires a number of *accompaniments*. The changes in its courſe furniſh a variety of ſituations; while the fertility, convenience, and amenity, which attend it, account for all appearances of inhabitants and improvement. Profuſion of ornament on a fictitious river, is a juſt imitation of cultivated nature. Every ſpecies of building, every ſtyle of plantation, may abound on the banks; and whatever be their characters, their proximity to the water is commonly the happieſt circumſtance in their ſituation. A luſtre is from thence diffuſed on all around; each derives an importance from its relation to this capital feature; thoſe which are near enough to be reflected, immediately belong to it; thoſe at a greater diſtance ſtill ſhare in the animation of the ſcene; and objects totally detached from each other, being all attracted towards the ſame intereſting connexion, are united into one compoſition.

In the front of Blenheim was a deep broad valley, which abruptly ſeparated the caſtle from the lawn and the plantations before it; even a direct approach could not be made without building a monſtrous bridge over the vaſt hollow; but this forced communication was only a ſubject of raillery; and the ſcene continued broken into two parts, abſolutely diſtinct from each other. This valley has been lately flooded: it is not filled; the bottom only is covered with water; the ſides are ſtill very high; but they are no longer the ſteeps of a chaſm, they are the bold ſhores of a noble river. The ſame bridge is ſtanding without alteration: but no extravagance remains; the water gives it propriety. Above it the river firſt appears, winding from behind a ſmall thick wood in the valley; and ſoon taking a determined courſe, it is then broad enough to admit an iſland filled with the fineſt trees; others correſponding to them in growth and diſpoſition, ſtand in groups on the banks, intermixed with younger plantations. Immediately below the bridge, the river ſpreads into a large expanſe: the ſides are open lawn. On that furtheſt from the houſe formerly ſtood the palace of Henry II. celebrated in many an ancient ditty by the name of Fair Roſamond's Bower. A little clear ſpring, which riſes there, is by the country people ſtill called Fair Roſamond's Well. The ſpot is now marked by a ſingle willow. Near it is a fine collateral ſtream, of a beautiful form, retaining its breadth as far as it is ſeen, and retiring at laſt behind a hill from the view. The main river, having received this acceſſion, makes a gentle bend: then continues for a conſiderable length in one wide direct reach; and, juſt as it diſappears, throws itſelf down a high caſcade, which is the preſent termination. On one of the banks of this reach is the garden: the ſteeps are there diverſified with thickets and with glades; but the covert prevails, and the top is crowned with lofty trees. On the other ſide is a noble hanging wood in the park: it was depreciated when it ſunk into a hollow, and was poorly loſt in the bottom; but it is now a rich appendage to the river, falling down an eaſy ſlope quite to the water's edge, where, with overſhadowing, it is reflected on the ſurface. Another face of the ſame wood borders the collateral ſtream, with an outline more indented and various: while a very large irregular clump adorns the oppoſite declivity. This clump is at a conſiderable diſtance from the principal river: but the ſtream it belongs to brings it down to connect with the reſt; and the other objects, which were before diſperſed, are now, by the intereſt of each in a relation, which is common to all, collected into one illuſtrious ſcene. The caſtle itſelf is a prodigious pile of building; which, with all the faults in its architecture, will never ſeem leſs than a truly princely habitation; and the confined ſpot where it was placed, on the edge of an abyſs, is converted into a proud ſituation, commanding a beautiful proſpect of water, and open to an extenſive lawn, adequate to the manſion, and an emblem of its domain. In the midſt of this lawn ſtands a column, a ſtately trophy, recording the exploits of the duke of Marlborough and the gratitude of Britain. Between this pillar and the caſtle is the bridge, which now, applied to a ſubject worthy of it, is eſtabliſhed in all the importance due to its greatneſs. The middle arch is wider than the Rialto, but not too wide for the occaſion; and yet that is the narroweſt part of the river; but the length of the reaches is everywhere proportioned to their breadth. Each of them is alone a noble piece of water; and the laſt, the fineſt of all, loſes itſelf gradually in a wood, which on that ſide is alſo the boundary of the lawn, and riſes into the horizon. All is great in the front of Blenheim: but in that vaſt ſpace no void appears; ſo important are the parts, ſo magnificent the object. The plain is extenſive, the valley is broad, the wood is deep. Though the intervals between the building are large, they are filled with the grandeur which buildings of ſuch dimenſions and ſo much pomp diffuſe all around them; and the river in its long varied courſe, approaching to every object, and touching upon every part, ſpreads its influence over the whole.

Water.

In the compoſition of this ſcene, the river, both as a part itſelf, and as uniting the other parts, has a principal ſhare. But water is not loſt though it be in ſo confined or ſo concealed a ſpot as to enter into no view; it may render that ſpot delighful. It is capable of the moſt exquiſite beauty in its form; and though not in ſpace, may yet in diſpoſition have pretenſions to greatneſs; for it may be divided into ſeveral branches, which will form a cluſter of iſlands all connected together, make the whole place irriguous, and, in the ſtead of extent, ſupply a quantity of water. Such a ſequeſtered ſcene uſually owes its retirement to the trees and the thickets with which it abounds; but, in the diſpoſition of them, one diſtinction ſhould be conſtantly attended to. A river flowing through a wood which overſpreads one continued ſurface of ground, and a river between two woods, are in very different circumſtances. In the latter caſe, the woods are ſeparate; they may be contraſted in their forms and their characters, and the outline of each ſhould be forcibly marked. In the former no outline ought to be diſcernible; for the river paſſes between trees, not between boundaries; and though in the progreſs of its courſe, the ſtyle of the plantations may be often changed, yet on the oppoſite banks a ſimilarity ſhould conſtantly prevail, that the identity of the wood may never be doubtful.

Water.

A river between two woods may enter into a view; and then it muſt be governed by the principles which regulate the conduct and the accompaniments of a river in an open expoſure. But when it runs through a wood, it is never to be ſeen in a proſpect; the place is naturally full of obſtructions; and a continued opening, large enough to receive a long reach, would ſeem an artificial cut. The river muſt therefore neceſſarily wind more than in croſſing a lawn where the paſſage is entirely free. But its influence will never extend ſo far on the ſides: the buildings muſt be near the banks: and, if numerous, will ſeem crowded, being all in one track, and in ſituations nearly alike. The ſcene, however, does not want variety: on the contrary, none is capable of more. The objects are not indeed ſo different from each other as in an open view; but they are very different, and in much greater abundance; for this is the interior of a wood, where every tree is an object, every combination of trees a variety, and no large intervals are requiſite to diſtinguiſh the ſeveral diſpoſitions; the grove, the thicket or the groups, may prevail, and their forms and their relations may be conſtantly changed without reſtraint of fancy, or limitation of number.

Water is ſo univerſally and ſo deſervedly admired in a proſpect, that the moſt obvious thought in the management of it, is to lay it as open as poſſible; and purpoſely to conceal it would generally ſeem a ſevere ſelf-denial: yet ſo many beauties may attend its paſſage through a wood, that larger portions of it might be allowed to ſuch retired ſcenes than are commonly ſpared from the view, and the different parts in different ſtyles would be fine contraſts to each other. If the water at Wotton * were all expoſed, a walk of near two miles along the banks would be of a tedious length, from the want of thoſe changes of the ſcene which now ſupply through the whole extent a ſucceſſion of perpetual variety. The extent is ſo large as to admit of a diviſion into four principal parts, all of them great in ſtyle and in dimenſions, and differing from each other both in character and ſituation. The two firſt are the leaſt. The one is a reach of a river, about the third of a mile in length, and of a competent breadth, flowing through a lovely mead, open in ſome places to views of beautiful hills in the country, and adorned in others with clumps of trees, ſo large, that their branches ſtretch quite acroſs, and form a high arch over the water. The next ſeems to have been once a formal baſin encompaſſed with plantations, and the appendages on either ſide ſtill retain ſome traces of regularity; but the ſhape of the water is free from them; the ſize is about 14 acres; and out of it iſſue two broad collateral ſtreams, winding towards a large river, which they are ſeen to approach, and ſuppoſed to join. A real junction is however impoſſible, from the difference of the levels; but the terminations are ſo artfully concealed, that the deception is never ſuſpected, and when known is not eaſily explained. The river is the third great diviſion of the water; a lake into which it falls, is the fourth. Theſe two do actually join; but their characters are directly oppoſite; the ſcenes they belong to are totally diſtinct; and the tranſition from the one to the other is very gradual; for an iſland near the conflux, dividing the breadth, and concealing the end of the lake, moderates for ſome way the ſpace; and permitting it to expand but by degrees, raiſes an idea of greatneſs, from uncertainty accompanied with increaſe. The reality does not diſappoint the expectation; and the iſland, which is the point of view, is itſelf equal to the ſcene: it is large, and high above the lake; the ground is irregularly broken; thickets hang on the ſides; and towards the top is placed an Ionic portico, which commands a noble extent of water, not leſs than a mile in circumference, bounded on one ſide with wood, and open on the other to two ſloping lawns, the leaſt of an hundred acres, diverſified with clumps, and bordered by plantations. Yet this lake, when full in view, and with all the importance which ſpace, form, and ſituation can give, is not more intereſting than the ſequeſtered river, which has been mentioned as the third great diviſion of the water. It is juſt within the verge of a wood, three quarters of a mile long, everywhere broad, and its courſe is ſuch as to admit of infinite variety without any confuſion. The banks are cleared of underwood; but a few thickets ſtill remain, and on one ſide an impenetrable covert ſoon begins: the interval is a beautiful grove of oaks, ſcattered over a green ſward of extraordinary verdure. Between theſe trees and theſe thickets the river ſeems to glide gently along, conſtantly winding, without one ſhort turn or one extended reach in the whole length of the way. This even temper in the ſtream ſuits the ſcenes through which it paſſes; they are in general of a very ſober caſt, not melancholy, but grave; never expoſed to a glare; never darkened with gloom; nor, by ſtrong contraſts of light and ſhade, exhibiting the exceſs of either. Undiſturbed by an extent of proſpect without, or a multiplicity of objects within, they retain at all times a mildneſs of character; which is ſtill more forcibly felt when the ſhadows grow faint as they lengthen, when a little ruſtling of birds in the ſpray, the leaping of the fiſh, and the fragrancy of the woodbine, denote the approach of evening; while the ſetting ſun ſhoots its laſt gleams on a Tuſcan portico, which is cloſe to the great baſin, but which from a ſeat near this river is ſeen at a diſtance, through all the obſcurity of the wood, glowing on the banks, and reflected on the ſurface of the water. In another ſtill more diſtinguiſhed ſpot is built an elegant bridge, with a colonnade upon it, which not only adorns the place where it ſtands, but is alſo a picturesque object to an octagon building near the lake, where it is ſhown in a ſingular ſituation, overarched, encompaſſed, and backed with wood, without any appearance of the water beneath. This building in return is alſo an object from the bridge; and a Chineſe room, in a little iſland juſt by, is another: neither of them are conſiderable, and the others which are viſible are at a diſtance; but more or greater adventitious ornaments are not required in a ſpot ſo rich as this in beauties peculiar to its character. A profuſion of water pours in from all ſides round upon the view; the opening of the lake appears; a glimpſe is caught of the large baſin: one of the collateral ſtreams is full in ſight, and the bridge itſelf is in the midſt of the fineſt part of the river: all ſeem to communicate the one with the other. Though thickets often intercept, and groups perplex the view, yet they never break the connexion between the ſeveral pieces of water; each may ſtill be traced

* Vale of Aylesbury, Buckinghamshire

Water. Ibid.

along large branches or little catches; which in ſome places are overſhadowed and dim; in others gliſten through a glade, or glimmer between the boles of trees in a diſtant perſpective; and in one, where they are quite loſt to the view, ſome arches of the ſtone bridge, but partially ſeen among the wood, preſerve their connexion

7 Of a Rill and a Rivulet.

3. If a large river may ſometimes, a ſmaller current undoubtedly may often, be conducted through a wood: it ſeldom adorns, it frequently diſfigures, a proſpect, where its courſe is marked, not by any appearance of water, but by a confuſed line of clotted graſs, which diſagrees with the general verdure. A *Rivulet* may, indeed, have conſideration enough for a home ſcene, though it be open; but a *Rill* is always moſt agreeable when moſt retired from public view. Its characteriſtic excellencies are vivacity and variety, which require attention, leiſure, and ſilence, that the eye may pore upon the little beauties, and the ear liſten to the low murmurs of the ſtream without interruption. To ſuch indulgence a confined ſpot only is favourable; a cloſe copſe is therefore often more acceptable than a high wood, and a ſequeſtered valley at all times preferable to any open expoſure: a ſingle rill at a very little diſtance is a mere water courſe; it loſes all its charms; it has no importance in itſelf, and bears no proportion to the ſcene. A number of little ſtreams have indeed an effect in any ſituation, but not as objects; they are intereſting only on account of the character they expreſs, the irriguous appearance which they give to the whole.

The full tide of a large river has more force than activity, and ſeems too unwieldy to allow of very quick tranſitions. But in a rill, the agility of its motion accounts for every caprice; frequent windings diſguiſe its inſignificance; ſhort turnings ſhow its vivacity; ſudden changes in the breadth are a ſpecies of its variety; and however fantaſtically the channel may be wreathed, contracted, and widened, it ſtill appears to be natural. We find an amuſement in tracing the little ſtream through all the intricacies of its courſe, and in ſeeing it force a paſſage through a narrow ſtrait, expatiate on every opportunity, ſtruggle with obſtructions, and puzzle out its way. A rivulet, which is the mean betwixt a river and a rill, partakes of the character of both: it is not licenſed to the extravagance of the one, nor under the ſame reſtraints as the other: it may have more frequent bends than the river, longer reaches than a rill: the breadth of a ſtream determines whether the principal beauty reſults from extent or from variety.

The murmurs of a rill are amongſt the moſt pleaſing circumſtances which attend it. If the bed of the ſtream be rough, mere declivity will occaſion a conſtant ripling noiſe: when the current drops down a deſcent, though but of a few inches, or forcibly bubbles up from a little hollow, it has a deep gurgling tone, not uniformly continued, but inceſſantly repeated, and therefore, more engaging than any. The flatteſt of all, is that ſound rather of the ſplaſhing than the fall of water, which an even gentle ſlope, or a tame obſtruction, will produce: this is leſs pleaſing than the others; but none ſhould be entirely excluded: all in their turns are agreeable; and the choice of them is much in our power. By obſerving their cauſes, we may often find the means to ſtrengthen, to weaken, or to change them; and the addition or removal of a ſingle ſtone, or a few pebbles, will ſometimes be ſufficient for the purpoſe.

Rocks.

8 Of Caſcades.

A rill cannot pretend to any ſound beyond that of a little water fall: the roar of a caſcade belongs only to a larger ſtream; but it may be produced by a rivulet to a conſiderable degree, and attempts to do more have generally been unſucceſsful. A vain ambition to imitate nature in her great extravagancies betrays the weakneſs of art. Though a noble river, throwing itſelf headlong down a precipice, be an object truly magnificent, it muſt however be confeſſed, that in a ſingle ſheet of water there is a formality which its vaſtneſs alone can cure. But the height, not the breadth, is the wonder: when it falls no more than a few feet, the regularity prevails; and its extent only ſerves to expoſe the vanity of affecting the ſtyle of a cataract in an artificial caſcade. It is leſs exceptionable if divided into ſeveral parts: for then each ſeparate part may be wide enough for its depth; and in the whole, variety, not greatneſs, will be the predominant character. But a ſtructure of rough, large, detached ſtones, cannot eaſily be contrived of ſtrength ſufficient to ſupport a great weight of water: it is ſometimes from neceſſity almoſt ſmooth and uniform, and then it loſes much of its effects. Several little falls in ſucceſſion are preferable to one great caſcade which in figure or in motion approaches to regularity.

When greatneſs is thus reduced to number, and length becomes of more importance than breadth, a rivulet vies with a river: and it more frequently runs in a continued declivity, which is very favourable to ſuch a ſucceſſion of falls. Half the expence and labour which are ſometimes beſtowed on a river, to give it at the beſt a forced precipitancy in one ſpot only, would animate a rivulet through the whole of its courſe. And, after all, the moſt intereſting circumſtance in falling waters is their animation. A great caſcade fills us with ſurpriſe: but all ſurpriſe muſt ceaſe; and the motion, the agitation, the rage, the froth, and the variety of the water, are finally the objects which engage the attention: for theſe a rivulet is ſufficient; and they may there be produced without that appearance of effort which raiſes a ſuſpicion of art.

To obviate ſuch a ſuſpicion, it may be ſometimes expedient to begin the deſcent out of ſight; for the beginning is the difficulty: if that be concealed, the ſubſequent falls ſeem but a conſequence of the agitation which characteriſes the water at its firſt appearance; and the imagination is, at the ſame time, let looſe to give ideal extent to the caſcades. When a ſtream iſſues from a wood, ſuch management will have a great effect: the bends of its courſe in an open expoſure may afford frequent opportunities for it; and ſometimes a low broad bridge may furniſh the occaſion: a little fall hid under the arch will create a diſorder; in conſequence of which, a greater caſcade below will appear very natural.

9 Of Rocks.

IV. ROCKS. Rocks are themſelves too vaſt and too ſtubborn to ſubmit to our controul; by the addition or removal of appendages which we can command, parts may be ſhown or concealed, and the characters with their impreſſions may be weakened or enforced:

Rocks.

forced: to adopt the accompaniments accordingly, is the utmoſt ambition of art when rocks are the ſubject.

Their moſt diſtinguiſhed characters are, *dignity*, *terror*, and *fancy:* the expreſſions of all are conſtantly wild: and ſometimes a rocky ſcene is only wild, without pretenſions to any particular character.

Rills, rivulets, and caſcades, abound among rocks: they are natural to the ſcene; and ſuch ſcenes commonly require every accompaniment which can be procured for them. Mere rocks, unleſs they are particularly adapted to certain impreſſions, though they may ſurpriſe, cannot be long engaging, if the rigour of their character be not ſoftened by circumſtances which may belong either to theſe or to more cultivated ſpots: and when the drearineſs is extreme, little ſtreams and waterfalls are of themſelves inſufficient for the purpoſe; an intermixture of vegetation is alſo neceſſary, and on ſome occaſions even marks of inhabitants are proper.

Large clefts, ſloping or precipitous, with a dale at bottom, furniſh ſcenes of the wildeſt nature. In ſuch ſpots, verdure alone will give ſome relief to the drearineſs of the ſcene; and ſhrubs or buſhes, without trees, are a ſufficiency of wood: the thickets may alſo be extended by the creeping plants, ſuch as pyracantha, vines, and ivy, to wind up the ſides or cluſter on the tops of the rocks. And to this vegetation may be added ſome ſymptoms of inhabitants, but they muſt be ſlight and few; the uſe of them is only to cheer, not to deſtroy, the ſolitude of the place; and ſuch therefore ſhould be choſen as are ſometimes found in ſituations retired from public reſort; a cottage may be lonely, but it muſt not here ſeem ruinous and neglected; it ſhould be tight and warm, with every mark of comfort about it, to which its poſition in ſome ſheltered receſs may greatly contribute. A cavity alſo in the rocks, rendered eaſy of acceſs, improved to a degree of convenience, and maintained in a certain ſtate of preſervation, will ſuggeſt ſimilar ideas of protection from the bittereſt inclemencies of the ſky, and even of occaſional refreſhment and repoſe. But we may venture ſtill further; a mill is of neceſſity often built at ſome diſtance from the town which it ſupplies; and here it would at the ſame time apply the water to a uſe, and increaſe its agitation. The dale may beſides be made the haunt of thoſe animals, ſuch as goats, which are ſometimes wild, and ſometimes domeſtic; and which accidentally appearing, will divert the mind from the ſenſations natural to the ſcene, but not agreeable if continued long without interruption. Theſe and ſuch other expedients will approximate the ſevereſt retreat to the habitations of men, and convert the appearance of a perpetual baniſhment into that of a temporary retirement from ſociety.

But too ſtrong a force on the nature of the place always fails. A winding path, which appears to be worn, not cut, has more effect than a high road, all artificial and level, which is too weak to overbear, and yet contradicts, the general idea. The objects therefore to be introduced muſt be thoſe which hold a mean between ſolitude and population; and the inclination of that choice towards either extreme, ſhould be directed by the degree of wildneſs which prevails; for though that runs ſometimes to an exceſs which requires correction, at other times it wants encouragement, and at all times it ought to be preſerved: it is the predominant character of rocks, which mixes with every other, and to which all the appendages muſt be accommodated; and they may be applied ſo as greatly to increaſe it: a licentious irregularity of wood and of ground, and a fantaſtic conduct of the ſtreams, neither of which would be tolerated in the midſt of cultivation, become and improve romantic rocky ſpots; even buildings, partly by their ſtyle, but ſtill more by their poſition, in ſtrange, difficult, or dangerous ſituations, diſtinguiſh and aggravate the native extravagancies of the ſcene.

Rocks.

Greatneſs is a chief ingredient in the character of *dignity*, with leſs of wildneſs than in any other. The effect here depends more upon amplitude of ſurface, than variety of forms. The parts, therefore, muſt be large: if the rocks are only high, they are but ſtupendous, not majeſtic: breadth is equally eſſential to their greatneſs; and every ſlender, every groteſque ſhape, is excluded. Art may interpoſe to ſhow theſe large parts to the eye, and magnify them to the imagination, by taking away thickets which ſtretch quite acroſs the rocks, ſo as to diſguiſe their dimenſions; or by filling with wood the ſmall intervals between them, and thus, by concealing the want, preſerving the appearance of continuation. When rocks retire from the eye down a gradual declivity, we can, by raiſing the upper ground, deepen the fall, lengthen the perſpective, and give both height and extent to thoſe at a diſtance: this effect may be ſtill increaſed by covering that upper ground with a thicket, which ſhall ceaſe, or be lowered, as it deſcends. A thicket, on other occaſions, makes the rocks which riſe out of it ſeem larger than they are. If they ſtand upon a bank overſpread with ſhrubs, their beginning is at the leaſt uncertain; and the preſumption is, that they ſtart from the bottom. Another uſe of this bruſhy underwood is to conceal the fragments and rubbiſh which have fallen from the ſides and the brow, and which are often unſightly. Rocks are ſeldom remarkable for the elegance of their forms; they are too vaſt, and too rude, to pretend to delicacy: but their ſhapes are often agreeable: and we can affect thoſe ſhapes to a certain degree, at leaſt we can cover many blemiſhes in them, by conducting the growth of ſhrubby and creeping plants about them.

For all theſe purpoſes mere underwood ſuffices: but for greater effects larger trees are requiſite: they are worthy of the ſcene; and not only improvements, but acceſſions to its grandeur: we are uſed to rank them among the nobleſt objects of nature; and when we ſee that they cannot aſpire to the midway of the heights around them, the rocks are raiſed by the compariſon. A ſingle tree is, therefore, often preferable to a clump: the ſize, though really leſs, is more remarkable: and clumps are beſides generally exceptionable in a very wild ſpot, from the ſuſpicion of art which attends them; but a wood is free from that ſuſpicion, and its own character of greatneſs recommends it to every ſcene of magnificence.

On the ſame principle all poſſible conſideration ſhould be given to the ſtreams. No number of little rills are equal to one broad river; and in the principal current, ſome varieties may be ſacrificed to importance: but a degree of ſtrength ſhould always be preſerved: the water, though it needs not be furious, ſhould not be

Rocks, Ibid, dull; for dignity, when moſt ſerene, is not languid; and ſpace will hardly atone for want of animation.

This character does not exclude marks of inhabitants, though it never requires them to tame its wildneſs: and without inviting, it occaſionally admits an intermixture of vegetation. It even allows of buildings intended only to decorate the ſcene: but they muſt be adequate to it, both in ſize and in character. And if cultivation is introduced, that too ſhould be conformable to the reſt; not a ſingle narrow patch cribbed out of the waſte; but the confines of a country ſhelving into the vale, and ſuggeſting the idea of extent: nothing trivial ought to find admittance. But, on the other hand, no extravagance is required to ſupport it; ſtrange ſhapes in extraordinary poſitions, enormous weights unaccountably ſuſtained, trees rooted in the ſides, and torrents raging at the foot of the rocks, are at the beſt needleſs exceſſes. There is a temperance in dignity, which is rather hurt by a wanton violence on the common order of nature.

The terrors of a ſcene in nature are like thoſe of a dramatic repreſentation: they give an alarm; but the ſenſations are agreeable, ſo long as they are kept to ſuch as are allied only to terror, unmixed with any that are horrible and diſguſting. Art may therefore be uſed to heighten them, to diſplay the objects which are diſtinguiſhed by greatneſs, to improve the circumſtances which denote force, to mark thoſe which intimate danger, and to blend withal here and there a caſt of melancholy.

Greatneſs is as eſſential to the character of *terror* as to that of dignity: vaſt efforts in little objects are but ridiculous; nor can force be ſuppoſed upon trifles incapable of reſiſtance. On the other hand, it muſt be allowed, that exertion and violence ſupply ſome want of ſpace. A rock wonderfully ſupported, or threatening to fall, acquires a greatneſs from its ſituation, which it has not in dimenſions; ſo circumſtanced, the ſize appears to be monſtrous: a torrent has a conſequence which a placid river of equal breadth cannot pretend to; and a tree, which would be inconſiderable in the natural ſoil, becomes important when it burſts forth from a rock.

Such circumſtances ſhould be always induſtriouſly ſought for. It may be worth while to cut down ſeveral trees, in order to exhibit one apparently rooted in the ſtone. By the removal perhaps of only a little bruſhwood, the alarming diſpoſition of a rock, ſtrangely undermined, rivetted, or ſuſpended, may be ſhown; and if there be any ſoil above its brow, ſome trees planted there, and impending over it, will make the object ſtill more extraordinary. As to the ſtreams, great alterations may generally be made in them: and therefore it is of uſe to aſcertain the ſpecies proper to each ſcene, becauſe it is in our power to enlarge or contract their dimenſions; to accelerate or retard their rapidity; to form, increaſe, or take away obſtructions; and always to improve, often to change, their characters.

Inhabitants furniſh frequent opportunities to ſtrengthen the appearances of force, by giving intimations of danger. A houſe placed at the edge of a precipice, any building on the pinnacle of a crag, makes that ſituation ſeem formidable, which might otherwiſe have been unnoticed: a ſteep, in itſelf not very remarkable, becomes alarming, when a path is carried aſlant up the ſide: a rail on the brow of a perpendicular fall, ſhows that the height is frequented and dangerous: and a common foot bridge thrown over a cleft between rocks has a ſtill ſtronger effect. In all theſe inſtances, the imagination immediately tranſports the ſpectator to the ſpot, and ſuggeſts the idea of looking down ſuch a depth; in the laſt, that depth is a chaſm, and the ſituation is directly over it. Rocks.

In other inſtances, exertion and danger ſeem to attend the occupations of the inhabitants:

> ———Half way down
> Hangs one that gathers ſamphire; dreadful trade!

is a circumſtance choſen by the great poet of nature, to aggravate the terror of the ſcene he deſcribes.

The different ſpecies of rocks often meet in the ſame place, and compoſe a noble ſcene, which is not diſtinguiſhed by any particular character; it is only when one eminently prevails, that it deſerves ſuch a preference as to exclude every other. Sometimes a ſpot, remarkable for nothing but its wildneſs, is highly romantic: and when this wildneſs riſes to *fancy;* when the moſt ſingular, the moſt oppoſite forms and combinations are thrown together; then a mixture alſo of ſeveral characters adds to the number of inſtances which there concur to diſplay the inexhauſtible variety of nature.

So much variety, ſo much fancy, are ſeldom found within the ſame extent as in Dovedale *. It is about two miles in length, a deep, narrow, hollow valley: both the ſides are of rock; and the Dove in its paſſage between them is perpetually changing its courſe, its motion, and appearance. It is never leſs than ten, nor ſo much as twenty, yards wide, and generally about four feet deep; but tranſparent to the bottom, except when it is covered with a foam of the pureſt white, under waterfalls, which are perfectly lucid. Theſe are very numerous, but very different. In ſome places they ſtretch ſtraight acroſs, or aſlant the ſtream: in others, they are only partial; and the water either daſhes againſt the ſtones, and leaps over them, or, pouring along a ſteep, rebounds upon thoſe below; ſometimes it ruſhes through the ſeveral openings between them; ſometimes it drops gently down; and at other times it is driven back by the obſtruction, and turns into an eddy. In one particular ſpot, the valley, almoſt cloſing, leaves hardly a paſſage for the river, which, pent up, and ſtruggling for a vent, rages, and roars, and foams, till it has extricated itſelf from the confinement. In other parts, the ſtream, though never languid, is often gentle; flows round a little deſert iſland, glides between bits of bulruſhes, diſperſes itſelf among tufts of graſs or of moſs, bubbles about a water dock, or plays with the ſlender threads of aquatic plants which float upon the ſurface. The rocks all along the dale vary as often in their ſtructure as the ſtream in its motion. In one place, an extended ſurface gradually diminiſhes from a broad baſe almoſt to an edge: in another, a heavy top hanging forwards, overſhadows all beneath: ſometimes many different ſhapes are confuſedly tumbled together; and ſometimes they are broken into ſlender ſharp pinnacles, which are upright, often two or three together, and often in more numerous cluſters. On this ſide of the dale,

*Near Aſhbourne in Derbyſhire.

Rocks. dale, they are univerſally bare; on the other, they are intermixed with wood; and the vaſt height of both the ſides, with the narrowneſs of the interval between them, produces a further variety: for whenever the ſun ſhines from behind the one, the form of it is diſtinctly and completely caſt upon the other; the rugged ſurface on which it falls diverſifies the tints; and a ſtrong reflected light often glares on the edge of the deepeſt ſhadow. The rocks never continue long in the ſame figure or ſituation, and are very much ſeparated from each other: ſometimes they form the ſides of the valley, in precipices, in ſteeps, or in ſtages; ſometimes they ſeem to riſe in the bottom, and lean back againſt the hill; and ſometimes they ſtand out quite detached, heaving up in cumbrous piles, or ſtarting into conical ſhapes, like vaſt ſpars, 100 feet high; ſome are firm and ſolid throughout; ſome are cracked; and ſome, ſplit and undermined, are wonderfully upheld by fragments apparently unequal to the weight they ſuſtain. One is placed before, one over another, and one fills at ſome diſtance behind an interval between two. The changes in their diſpoſition are infinite; every ſtep produces ſome new combination; they are continually croſſing, advancing, and retiring; the breadth of the valley is never the ſame 40 yards together: at the narrow paſs which has been mentioned, the rocks almoſt meet at the top, and the ſky is ſeen as through a chink between them: juſt by this gloomy abyſs, is a wider opening, more light, more verdure, more cheerfulneſs than anywhere elſe in the dale. Nor are the forms and the ſituations of the rocks their only variety: many of them are perforated by large natural cavities, ſome of which open to the ſky, ſome terminate in dark receſſes, and through ſome are to be ſeen ſeveral more uncouth arches, and rude pillars, all detached, and retiring beyond each other, with the light ſhining in between them, till a rock far behind them cloſes the perſpective: the noiſe of the caſcades in the river echoes amongſt them; the water may often be heard at the ſame time gurgling near, and roaring at a diſtance; but no other ſounds diſturb the ſilence of the ſpot: the only trace of men is a blind path, but lightly and but ſeldom trodden, by thoſe whom curioſity leads to ſee the wonders they have been told of Dovedale. It ſeems indeed a fitter haunt for mere ideal beings: the whole has the air of enchantment. The perpetual ſhifting of the ſcenes; the quick tranſitions, the total changes, then the forms all around, groteſque as chance can caſt, wild as nature can produce, and various as imagination can invent; the force which ſeems to have been exerted to place ſome of the rocks where they are now fixed immoveable, the magic by which others appear ſtill to be ſuſpended; the dark caverns, the illuminated receſſes, the fleeting ſhadows, and the gleams of light glancing on the ſides, or trembling on the ſtream; and the lonelineſs and the ſtillneſs of the place, all crowding together on the mind, almoſt realize the ideas which naturally preſent themſelves in this region of romance and of fancy.

The ſolitude of ſuch a ſcene is agreeable, on account of the endleſs entertainment which its variety affords, and in the contemplation of which both the eye and the mind are delighted to indulge: marks of inhabitants and cultivation would diſturb that ſolitude; and ornamental buildings are too artificial in a place ſo abſolutely free from reſtraint. The only accompaniments proper for it are wood and water; and by theſe ſometimes improvements may be made. When two rocks ſimilar in ſhape and poſition are near together, by ſkirting one of them with wood, while the other is left bare, a material diſtinction is eſtabliſhed between them: if the ſtreams be throughout of one character, it is in our power, and ſhould be our aim, to introduce another. Variety is the peculiar property of the ſpot, and every acceſſion to it is a valuable acquiſition. On the ſame principle, endeavours ſhould be uſed not only to multiply, but to aggravate differences, and to increaſe diſtinctions into contraſts: but the ſubject will impoſe a caution againſt attempting too much. Art muſt almoſt deſpair of improving a ſcene, where nature ſeems to have exerted her invention. Fence, &c.

§ 2. *Of* FACTITIOUS ACCOMPANIMENTS.

THESE conſiſt of Fences, Walks, Roads, Bridges, Seats, and Buildings. *Practical Treatiſe on Planting and Gardening*, p. 593, &c.

"I. The FENCE, where the place is large, becomes neceſſary; yet the eye diſlikes conſtraint. Our ideas of liberty carry us beyond our own ſpecies: the imagination feels a diſlike in ſeeing even the brute creation in a ſtate of confinement. The birds wafting themſelves from wood to grove are objects of delight; and the hare appears to enjoy a degree of happineſs unknown to the barriered flock. Beſides, a tall fence frequently hides from the ſight objects the moſt pleaſing; not only the flocks and herds themſelves, but the ſurface they graze upon. Theſe conſiderations have brought the unſeen fence into general uſe.

This ſpecies of barrier it muſt be allowed incurs a degree of deception, which can ſcarcely be warranted upon any other occaſion. In this inſtance, however, it is a ſpecies of fraud which we obſerve in nature's practice: how often have we ſeen two diſtinct herds feeding to appearance in the ſame extended meadow; until coming abruptly upon a deep ſunk rivulet, or an unfordable river, we diſcover the deception.

Beſides the ſunk fence, another ſort of unſeen barrier may be made, though by no means equal to that, eſpecially if near the eye. This is conſtructed of paling, painted of the inviſible green. If the colour of the back ground were permanent, and that of the paint made exactly to correſpond with it, the deception would at a diſtance be complete; but back grounds in general changing with the ſeaſon, this kind of fence is the leſs eligible.

Clumps and patches of woodineſs ſcattered promiſcuouſly on either ſide of an unſeen winding fence, aſſiſt very much in doing away the idea of conſtraint. For by this means

> The wand'ring flocks that browſe between the ſhades,
> Seem oft to paſs their bounds; the dubious eye
> Decides not if they crop the mead or lawn.
>
> MASON.

"II. The WALK, in extenſive grounds, is as neceſſary as the fence. The beauties of the place are diſcloſed that they may be ſeen; and it is the office of the walk

Bridge, &c. Ibid.

walk to lead the eye from view to view; in order that whilſt the tone of health is preſerved by the favourite exerciſe of nature, the mind may be thrown into uniſon by the harmony of the ſurrounding objects.

The direction of the walk muſt be guided by the points of view to which it leads, and the nature of the ground it paſſes over: it ought to be made ſubſervient to the natural impediments (the ground, wood, and water) which fall in its way, without appearing to have any direction of its own. It can ſeldom run with propriety any diſtance in a ſtraight line; a thing which rarely occurs in a natural walk. The paths of the Negroes and the Indians are always crooked; and thoſe of the brute creation are very ſimilar. Mr Maſon's deſcription of this path of nature is happily conceived.

The peaſant driving through each ſhadowy lane
His team, that bends beneath th' incumbent weight
Of laughing Ceres, marks it with his wheel;
At night and morn, the milkmaid's careleſs ſtep
Has through yon paſture green, from ſtile to ſtile
Impreſt a kindred curve: the ſcudding hare
Draws to her dew-ſprent ſeat, o'er thymy heaths,
A path as gently waving———

Eng. Gard. v. 60.

"III. The ROAD may be a thing of neceſſity, as an approach to the manſion; or a matter of amuſement only, as a drive or a ride, from which the grounds and the ſurrounding country may be ſeen to advantage. It ſhould be the ſtudy of the artiſt to make the ſame road anſwer, as far as may be, the twofold purpoſe.

The road and the walk are ſubject to the ſame rule of nature and uſe. The direction ought to be natural and eaſy, and adapted to the purpoſe intended. A road of neceſſity ought to be ſtraighter than one of mere conveniency: in this, recreation is the predominant idea; in that, utility. But even in this the direct line may be diſpenſed with. The natural roads upon heaths and open downs, and the graſſy glades and green roads acroſs foreſts and extenſive waſtes, are proper ſubjects to be ſtudied.

"IV. The BRIDGE ſhould never be ſeen where it is not wanted: a uſeleſs bridge is a deception; deceptions are frauds; and fraud is always hateful, unleſs when practiſed to avert ſome greater evil. A bridge without water is an abſurdity; and half a one ſtuck up as an eye-trap is a paltry trick, which, though it may ſtrike the ſtranger, cannot fail of diſguſting when the fraud is found out.

In low ſituations, and wherever water abounds, bridges become uſeful, and are therefore pleaſing objects: they are looked for; and ought to appear not as objects of ornament only, but likewiſe as matters of utility. The walk or the road therefore ought to be directed in ſuch a manner as to croſs the water at the point in which the bridge will appear to the greateſt advantage.

In the conſtruction of bridges alſo, regard muſt be had to ornament and utility. A bridge is an artificial production, and as ſuch it ought to appear. It ranks among the nobleſt of human inventions; the ſhip and the fortreſs alone excel it. Simplicity and firmneſs are the leading principles in its conſtruction. Mr Wheatley's obſervation is juſt when he ſays, "The ſingle wooden arch, now much in faſhion, ſeems to me generally miſapplied. Elevated without occaſion ſo much above, it is totally detached from the river; it is often ſeen ſtraddling in the air, without a glimpſe of water to account for it; and the oſtentation of it as an ornamental object, diverts all that train of ideas which its uſe as a communication might ſuggeſt." But we beg leave to differ from this ingenious writer when he tells us, "that it is ſpoiled if adorned; it is disfigured if only painted of any other than a duſky colour." In a ruſtic ſcene, where nature wears her own coarſe garb, "the vulgar foot bridge of planks only guarded on one hand by a common rail, and ſupported by a few ordinary piles," may be in character; but amidſt a diſplay of ornamented nature, a contrivance of that kind would appear mean and paltry; and would be an affectation of ſimplicity rather than the lovely attribute itſelf. In cultivated ſcenes, the bridge ought to receive the ornaments which the laws of architectural taſte allow; and the more poliſhed the ſituation, the higher ſhould be the ſtyle and finiſhings.

Buildings. Ibid.

"V. SEATS have a twofold uſe; they are uſeful as places of reſt and converſation, and as guides to the points of view in which the beauties of the ſurrounding ſcene are diſcloſed. Every point of view ſhould be marked with a ſeat; and, ſpeaking generally, no ſeat ought to appear but in ſome favourable point of view. This rule may not be invariable, but it ought ſeldom to be deviated from.

In the ruder ſcenes of neglected nature, the ſimple trunk, rough from the woodman's hands, and the butts or ſtools of rooted trees, without any other marks of tools upon them than thoſe of the ſaw which ſevered them from their ſtems, are ſeats in character; and in romantic or recluſe ſituations, the cave or the grotto are admiſſible. But wherever human deſign has been executed upon the natural objects of the place, the ſeat and every other artificial accompaniment ought to be in uniſon; and whether the bench or the alcove be choſen, it ought to be formed and finiſhed in ſuch a manner as to unite with the wood, the lawn, and the walk, which lie around it.

The colour of ſeats ſhould likewiſe be ſuited to ſituations: where uncultivated nature prevails, the natural brown of the wood itſelf ought not to be altered; but where the rural art preſides, white or ſtone colour has a much better effect."

"VI. BUILDINGS probably were firſt introduced into gardens merely for contrivance, to afford refuge from a ſudden ſhower, and ſhelter againſt the wind; or, at the moſt, to be ſeats for a party; or for retirement. They have ſince been converted into objects, and now the original *uſe* is too often forgotten in the greater purpoſes to which they are applied: they are conſidered as objects only; the inſide is totally neglected, and a pompous edifice frequently wants a room barely comfortable. Sometimes the pride of making a laviſh diſplay to a viſitor without any regard to the owner's enjoyments, and ſometimes too ſcrupulous an attention to the ſtyle of the ſtructure, occaſions a poverty and dulneſs within, which deprive the buildings of part of their utility. But in a garden they ought to be conſidered both as beautiful objects and as agreeable

Mr Wheatley's Obſervations reſumed.

Buildings. greeable retreats: if a character becomes them, it is that of the ſcene they belong to; not that of their primitive application. A Grecian temple or Gothic church may adorn ſpots where it would be affectation to preſerve that ſolemnity within which is proper for places of devotion: they are not to be exact models, ſubjects only of curioſity or ſtudy: they are alſo ſeats: and ſuch ſeats will be little frequented by the proprietor; his mind muſt generally be indiſpoſed to ſo much ſimplicity, and ſo much gloom, in the midſt of gaiety, richneſs, and variety.

But though the interior of buildings ſhould not be diſregarded, it is by their exterior that they become *objects*; and ſometimes by the one, ſometimes by the other, and ſometimes by both, they are entitled to be conſidered as *characters*.

10 Of buildings intended for objects,

1. As objects, they are deſigned either to *diſtinguiſh*, or to *break*, or to *adorn*, the ſcenes to which they are applied.

The differences between one wood, one lawn, one piece of water, and another, are not always very apparent: the ſeveral parts of a garden would, therefore, often ſeem ſimilar, if they were not diſtinguiſhed by buildings; but theſe are ſo obſervable, ſo obvious at a glance, ſo eaſily retained in the memory, they mark the ſpots where they are placed with ſo much ſtrength, they attract the relation of all around with ſo much power, that parts thus diſtinguiſhed can never be confounded together. Yet it by no means follows, that therefore every ſcene muſt have its edifice: the want of one is ſometimes a variety; and other circumſtances are often ſufficiently characteriſtic: it is only when theſe too nearly agree, that we muſt have recourſe to buildings for differences: we can introduce, exhibit, or contraſt them as we pleaſe: the moſt ſtriking object is thereby make a mark of diſtinction; and the force of this firſt impreſſion prevents our obſerving the points of reſemblance.

Obſerv. on Mod. Gardening. The uniformity of a view may be broken by ſimilar means, and on the ſame principle: when a wide heath a dreary moor, or a continual plain, is in proſpect, objects which catch the eye ſupplant the want of variety: none are ſo effectual for this purpoſe as buildings. Plantations or water can have no very ſenſible effect, unleſs they are large or numerous, and almoſt change the character of the ſcene: but a ſmall ſingle building diverts the attention at once from the ſameneſs of the extent; which it breaks, but does not divide; and diverſifies, without altering its nature. The deſign, however, muſt not be apparent. The merit of a cottage applied to this purpoſe, conſiſts in its being free from the ſuſpicion: and a few trees near it will both enlarge the object, and account for its poſition. Ruins are a hackneyed device immediately detected, unleſs their ſtyle be ſingular, or their dimenſions extraordinary. The ſemblance of an ancient Britiſh monument might be adapted to the ſame end, with little trouble, and great ſucceſs. The materials might be brick, or even timber plaſtered over, if ſtone could not eaſily be procured: whatever they were, the fallacy would not be diſcernible; it is an object to be ſeen at a diſtance, rude, and large, and in character agreeable to a wild open view. But no building ought to be introduced, which may not in reality belong to ſuch a ſituation: no Grecian temples, no Turkiſh moſques, no Egyptian obeliſks or pyramids; none imported from foreign countries, and unuſual here. The apparent artifice would deſtroy an effect, which is ſo nice as to be weakened, if objects proper to produce it are diſplayed with too much oſtentation; if they ſeem to be contrivances, not accidents; and the advantage of their poſition appear to be more laboured than natural. Buildings.

But in a garden, where objects are intended only to adorn, every ſpecies of architecture may be admitted, from the Grecian down to the Chineſe; and the choice is ſo free, that the miſchief moſt to be apprehended is an abuſe of this latitude in the multiplicity of buildings. Few ſcenes can bear more than two or three: in ſome, a ſingle one has a greater effect than any number: and a careleſs glimpſe, here and there, of ſuch as belong immediately to different parts, frequently enliven the landſcape with more ſpirit than thoſe which are induſtriouſly ſhown. If the effect of a partial ſight, or a diſtant view, were more attended to, many ſcenes might be filled, without being crowded; a greater number of buildings would be tolerated, when they ſeemed to be caſual, not forced; and the animation, and the richneſs of the objects, might be had without pretence or diſplay.

Too fond an oſtentation of buildings, even of theſe which are principal, is a common error; and when all is done, they are not always ſhown to the greateſt advantage. Though their ſymmetry and their beauties ought in general to be diſtinctly and fully ſeen, yet an oblique is ſometimes better than a direct view: and they are often leſs agreeable objects when entire, than when a part is covered, or their extent is interrupted; when they are boſomed in wood, as well as backed by it; or appear between the ſtems of trees which riſe before or above them: thus thrown into perſpective, thus grouped and accompanied, they may be as important as if they were quite expoſed, and are frequently more pictureſque and beautiful.

But a ſtill greater advantage ariſes from this management, in connecting them with the ſcene: they are conſiderable, and different from all around them; inclined therefore to ſeparate from the reſt; and yet they are ſometimes ſtill more detached by the pains taken to exhibit them: that very importance which is the cauſe of the diſtinction ought to be a reaſon for guarding againſt the independence to which it is naturally prone, and by which an object, which ought to be a part of the whole, is reduced to a mere individual. An elevated is generally a noble ſituation. When it is a point or a pinnacle, the ſtructure may be a continuation of the aſcent; and on many occaſions, ſome parts of the building may deſcend lower than others, and multiply the appearances of connexion: but an edifice in the midſt of an extended ridge, commonly ſeems naked alone, and impoſed upon the brow, not joined to it. If wood, to accompany it, will not grow there, it had better be brought a little way down the declivity; and then all behind, above, and about it, are ſo many points of contact, by which it is incorporated into landſcape.

Accompaniments are important to a building; but they loſe much of their effect when they do not appear to be caſual. A little mount juſt large enough for it; a ſmall piece of water below, of no other uſe

Buildings. than to reflect it; and a plantation close behind, evidently placed there only to give it relief; are as artificial as the structure itself, and alienate it from the scene of nature into which it is introduced, and to which it ought to be reconciled. These appendages therefore should be so disposed, and so connected with the adjacent parts, as to answer other purposes, though applicable to this: that they may be bonds of union, not marks of difference; and that the situation may appear to have been chosen at the most, not made, for the building.

In the choice of a situation, that which shows the building best ought generally to be preferred: eminence, relief, and every other advantage which can be, ought to be given to an object of so much consideration: they are for the most part desirable; sometimes necessary; and exceptionable only when, instead of rising out of the scene, they are forced into it, and a contrivance to procure them at any rate is avowed without any disguise. There are, however, occasions, in which the most tempting advantages of situation must be waved; the general composition may forbid a building in one spot, or require it in another; at other times, the interest of the particular group it belongs to may exact a sacrifice of the opportunities to exhibit its beauties and importance; and at all times, the pretensions of every individual object must give way to the greater effect of the whole.

11 Of those expressive of character.

2. The same structure which adorns as an object, may also be expressive as a *character*. Where the former is not wanted, the latter may be desirable: or it may be weak for one purpose, and strong for the other; it may be grave, or gay; magnificent, or simple: and according to its style, may or may not be agreeable to the place it is applied to. But mere consistency is not all the merit which buildings can claim: their characters are sometimes strong enough to *determine*, *improve*, or *correct*, that of the scene: and they are so conspicuous, and so distinguished, that whatever force they have is immediately and sensibly felt. They are fit therefore to make a first impression; and when a scene is but faintly characterized, they give at once a cast which spreads over the whole, and which the weaker parts concur to support, though perhaps they were not able to produce it.

Nor do they stop at fixing an uncertainty, or removing a doubt; they raise and enforce a character already marked: a temple adds dignity to the noblest, a cottage simplicity to the most rural, scenes; the lightness of a spire, the airiness of an open rotunda, the splendour of a continued colonnade, are less ornamental than expressive; others improve cheerfulness into gaiety, gloom into solemnity, and richness into profusion: a retired spot, which might have been passed unobserved, is noticed for its tranquillity, as soon as it is appropriated by some structure to retreat; and the most unfrequented place seems less solitary than one which appears to have been the haunt of a single individual, or even of a sequestered family, and is marked by a lonely dwelling, or the remains of a deserted habitation.

The means are the same, the application of them only is different, when buildings are used to correct the character of the scene; to enliven its dulness, mitigate its gloom, or to check its extravagance; and, on a variety of occasions, to soften, to aggravate, or to counteract, particular circumstances attending it. But care must be taken that they do not contradict too strongly the prevailing idea: they may lessen the dreariness of a waste, but they cannot give it amenity; they may abate horrors, but they will never convert them into graces; they may make a tame scene agreeable, and even interesting, not romantic; or turn solemnity into cheerfulness, but not into gaiety. In these, and in many other instances, they correct the character, by giving it an inclination towards a better which is not very different; but they can hardly alter it entirely: when they are totally inconsistent with it, they are at the best nugatory. Buildings.

The great effects which have been ascribed to buildings do not depend upon those trivial ornaments and appendages which are often too much relied on; such as the furniture of a hermitage, painted glass in a Gothic church, and sculpture about a Grecian temple; grotesque or bacchanalian figures to denote gaiety, and death's heads to signify melancholy. Such devices are only descriptive, not expressive, of character; and must not be substituted in the stead of those superior properties, the want of which they acknowledge, but do not supply. They besides often require time to trace their meaning, and to see their application; but the peculiar excellence of buildings is, that their effects are instantaneous, and therefore the impressions they make are forcible. In order to produce such effects, the general style of the structure, and its position, are the principal considerations: either of them will sometimes be strongly characteristic alone; united, their powers are very great; and both are so important, that if they do not concur, at least they must not contradict one another.

12 Species and situations of buildings.

Every branch of architecture furnishes, on different occasions, objects proper for a garden; and there is no restraint on our selection, provided it be conformable to the style of the scene, proportioned to its extent, and agreeable to its character.

The choice of situations is also very free. A hermitage, indeed, must not be close to a road; but whether it be exposed to view on the side of a mountain, or concealed in the depth of a wood, is almost a matter of indifference; that it is at a distance from public resort is sufficient. A castle must not be sunk in a bottom; but that it should stand on the utmost pinnacle of a hill, is not necessary: on a lower knoll, and backed by the rise, it may appear to greater advantage as an object, and be much more important to the general composition. Many buildings, which from their splendour best become an open exposure, will yet be sometimes not ill bestowed on a more sequestered spot, either to characterize or adorn it; and others, for which a solitary would in general be preferred to an eminent situation, may occasionally be objects in very conspicuous positions. A Grecian temple, from its peculiar taste and dignity, deserves every distinction; it may, however, in the depth of a wood, be so circumstanced, that the want of those advantages to which it seems entitled will not be regretted. A happier situation cannot be devised, than that of the temple of Pan on the south lodge on Enfield Chase. It is of the usual oblong form, encompassed by a colonnade; in dimensions, and in style, it is equal to a most extensive landscape: and yet by the

antique

Buildings.

antique and ruſtic air of its Doric columns without baſes; by the chaſtity of its little ornaments, a crook, a pipe, and a ſcrip, and thoſe only over the doors; and by the ſimplicity of the whole both within and without; it is adapted with ſo much propriety to the thickets which conceal it from the view, that no one can wiſh it to be brought forward, who is ſenſible to the charms of the Arcadian ſcene which this building alone has created. On the other hand, a very ſpacious field, or ſheep walk, will not be diſgraced by a farm houſe, a cottage, or a Dutch barn; nor will they, though ſmall and familiar, appear to be inconſiderable or inſignificant objects. Numberleſs other inſtances might be adduced to prove the impoſſibility of reſtraining particular buildings to particular ſituations, upon any general principles: the variety in their forms is hardly greater than in their application. Only let not their uſes be diſguiſed, as is often abſurdly attempted with the humbler kinds. "A barn ‡ dreſſed up in the habit of a country church, or a farm houſe figuring away in the fierceneſs of a caſtle, are ridiculous deceptions. A landſcape daubed upon a board, and a wooden ſteeple ſtuck up in a wood, are beneath contempt."

‡ Painting and Gardening, p. 98.

Temples, thoſe favourite and moſt coſtly objects in gardens, too generally merit cenſure for their inutility, their profuſion, or the impropriety of their purpoſe. "Whether they be dedicated to Bacchus, Venus, Priapus, or any other demon of debauchery, they are in this age, enlightened with regard to theological and ſcientific knowledge, equally abſurd. Architecture, in this part of its ſphere, may more nobly, and with greater beauty and effect, be exerciſed upon a chapel, a mauſoleum, a monument, judiciouſly diſpoſed among the natural ornaments. The late Sir William Harbord has given us a model, of the firſt kind, at Gunton, in Norfolk; the pariſh church ſtanding in his park, and being an old unſightly building, he had it taken down, and a beautiful temple, under the direction of the Adams erected upon its ſite for the ſame ſacred purpoſe:—The mauſoleum at Caſtle-Howard, in Yorkſhire, the ſeat of the earl of Carliſle, is a noble ſtructure:—And as an inſtance of the laſt ſort, may be mentioned the Temple of Concord and Victory at Stowe, erected to the memory of the great Lord Chatham and his glorious war; a beautiful monumental building, ſuited to the greatneſs of the occaſion."

Ib. p. 599.

To the great variety above mentioned muſt be added, Mr Wheatley obſerves, the many changes which may be made by the means of ruins. They are a claſs by themſelves, beautiful as objects, expreſſive as characters, and peculiarly calculated to connect with appendages into elegant groups. They may be accommodated with eaſe to irregularity of ground, and their diſorder is improved by it. They may be intimately blended with trees and thickets; and the interruption is an advantage: for imperfection and obſcurity are their properties, and to carry the imagination to ſomething greater than is ſeen, is their effect. They may for any of theſe purpoſes be ſeparated into detached pieces: contiguity is not neceſſary, nor even the appearance of it, if the relation be preſerved; but ſtraggling ruins have a bad effect, when the ſeveral parts are equally conſiderable. There ſhould be one large maſs to raiſe an idea of greatneſs, to attract the others about it, and to be a common centre of union to all: the ſmaller pieces then mark the original dimenſions of one extenſive ſtructure; and no longer appear to be the remains of ſeveral little buildings.

Obſervations on Modern Gardening.

All remains excite an inquiry into the former ſtate of the edifice, and fix the mind in a contemplation of the uſe it was applied to; beſides the characters expreſſed by their ſtyle and poſition, they ſuggeſt ideas which would not ariſe from the buildings if entire. The purpoſes of many have ceaſed: an abbey, or a caſtle, if complete, can now be no more than a dwelling; the memory of the times, and of the manners to which they are adapted, is preſerved only in hiſtory, and in ruins; and certain ſenſations of regret, of veneration, or compaſſion, attend the recollection. Nor are theſe confined to the remains of buildings which are in diſuſe; thoſe of an old manſion raiſe reflections on the domeſtic comforts once enjoyed, and the ancient hoſpitality which reigned there. Whatever building we ſee in decay, we naturally contraſt its preſent with its former ſtate, and delight to ruminate on the compariſon. It is true that ſuch effects properly belong to real ruins: they are, however, produced in a certain degree by thoſe which are fictitious: the impreſſions are not ſo ſtrong, but they are exactly ſimilar; and the repreſentation, though it does not preſent facts to the memory, yet ſuggeſts ſubjects to the imagination. But, in order to affect the fancy, the ſuppoſed original deſign ſhould be clear, the uſe obvious, and the form eaſy to be traced: no fragments ſhould be hazarded without preciſe meaning, and an evident connexion; none ſhould be perplexed in their conſtruction, or uncertain as to their application. Conjectures about the form raiſe doubts about the exiſtence of the ancient ſtructure: the mind muſt not be allowed to heſitate; it muſt be hurried away from examining into the reality by the exactneſs and the force of the reſemblance.

In the ruins of Tintern abbey § the original conſtruction of the church is perfectly marked; and it is principally from this circumſtance that they are celebrated as a ſubject of curioſity and contemplation. The walls are almoſt entire; the roof only is fallen in, but moſt of the columns which divided the aiſles are ſtill ſtanding: of thoſe which have dropped down, the baſes remain, every one exactly in its place; and in the middle of the nave four lofty arches, which once ſupported the ſteeple, riſe high in the air above all the reſt, each reduced now to a narrow rim of ſtone, but completely preſerving its form. The ſhapes even of the windows are little altered; but ſome of them are quite obſcured, others partially ſhaded, by tufts of ivy; and thoſe which are moſt clear are edged with its ſlender tendrils, and lighter foliage, wreathing about the ſides and the diviſions: it winds round the pillars; it clings to the walls; and in one of the aiſles cluſters at the top in branches, ſo thick and ſo large as to darken the ſpace below. The other aiſles, and the great nave, are expoſed to the ſky: the floor is entirely overſpread with turf; and to keep it clear from weeds and buſhes, is now its higheſt preſervation. Monkiſh tomb ſtones and the monuments of benefactors long ſince forgotten, appear above the green ſward: the baſes of the pillars which have fallen, riſe out of it; and maimed effigies, and ſculpture worn with age and weather, Gothic capitals, carved

§ Between Chepſtow and Monmouth.

Art. cornices and various fragments, are ſcattered about, or lie in heaps piled up together. Other ſhattered pieces, though diſjointed and mouldering, ſtill occupy their original places; and a ſtaircaſe much impaired, which led to a tower now no more, is ſuſpended at a great height, uncovered and inacceſſible: nothing is perfect; but memorials of every part ſtill ſubſiſt; all certain, but all in decay; and ſuggeſting at once every idea which can occur in a ſeat of devotion, ſolitude, and deſolation. Upon ſuch models fictitious ruins ſhould be formed: and if any parts are entirely loſt, they ſhould be ſuch as the imagination can eaſily ſupply from thoſe which are ſtill remaining. Diſtinct traces of the building, which is ſuppoſed to have exiſted, are leſs liable to the ſuſpicion of artifice, than an unmeaning heap of confuſion. Preciſion is always ſatisfactory, but in the reality it is only agreeable; in the copy it is eſſential to the imitation.

A material circumſtance to the truth of the imitation is, that the ruins appear to be very old. The idea is beſides intereſting in itſelf: a monument of antiquity is never ſeen with indifference; and a ſemblance of age may be given to the repreſentation by the hue of the materials, the growth of ivy and other plants, and cracks and fragments ſeemingly occaſioned rather by decay than by deſtruction. An appendage evidently more modern than the principal ſtructure will ſometimes corroborate the effect: the ſhed of a cottager amidſt the remains of a temple, is a contraſt both to the former and to the preſent ſtate of the building; and a tree flouriſhing among ruins, ſhows the length of time they have lain neglected. No circumſtance ſo forcibly marks the deſolation of a ſpot once inhabited, as the prevalence of nature over it:

Campos ubi Troja fuit,

is a ſentence which conveys a ſtronger idea of a city totally overthrown, than a deſcription of its remains; but in a repreſentation to the eye, ſome remains muſt appear; and then the perverſion of them to an ordinary uſe, or an intermixture of a vigorous vegetation, intimates a ſettled deſpair of their reſtoration.

SECT. II. *Principles of Selection and Arrangement in the Subjects of Gardening.*

Planting and Gardening, p. 602.

I. OF ART. In the lower claſſes of rural improvements, art ſhould be ſeen as little as may be; and in the more negligent ſcenes of nature, every thing ought to appear as if it had been done by the general laws of nature, or had grown out of a ſeries of fortuitous circumſtances. But in the higher departments, art cannot be hid; and the *appearance* of deſign ought not to be excluded. A human production cannot be made perfectly natural; and held out as ſuch it becomes an impoſition. Our art lies in endeavouring to adapt the productions of nature to human taſte and perceptions; and if much art be uſed, do not *attempt* to hide it. Art ſeldom fails to pleaſe when executed in a maſterly manner: nay, it is frequently the deſign and execution, more than the production itſelf, that ſtrikes us. It is the artifice, not the deſign, which ought to be avoided. It is the labour and not the art which ought to be concealed. The rural artiſt ought, therefore, upon every occaſion, to endeavour to avoid labour; or, if indiſpenſably neceſſary, to conceal it. No trace ſhould be left to lead back the mind to the expenſive toil. A mound raiſed, a mountain levelled, or a uſeleſs temple built, convey to the mind feelings equally diſguſting. Picturesque Beauty, &c.

II. PICTURESQUE BEAUTY. Though the aids of art are as eſſential to gardening, as education is to manners; yet art may do too much: ſhe ought to be conſidered as the handmaid, not as the miſtreſs, of of nature; and whether ſhe be employed in carving a tree into the figure of an animal, or in ſhaping a view into the form of a picture, ſhe is equally culpable. The nature of the place is ſacred. Should this tend to landſcape, from ſome principal point of view, aſſiſt nature and perfect it; provided this can be done without injuring the views from other points. But do not diſfigure the natural features of the place:—do not ſacrifice its native beauties, to the arbitrary laws of landſcape painting. 13 Of Scenery. *Ibid.*

> Great Nature ſcorns controul; ſhe will not bear
> One beauty foreign to the ſpot or ſoil
> She gives thee to adorn: 'Tis thine alone
> To mend, not change, her features. MASON.

Nature ſcarcely knows the thing mankind call a *landſcape*. The landſcape painter ſeldom, if ever, finds it perfected to his hands; ſome addition or alteration is almoſt always wanted. Every man who has made his obſervations upon natural ſcenery, knows that the miſletoe of the oak occurs almoſt as often as a perfect natural landſcape; and to attempt to make up artificial landſcape upon every occaſion is unnatural and abſurd.

If, indeed, the eye were fixed in one point, the trees could be raiſed to their full height at command, and the ſun be made to ſtand ſtill, the rural artiſt might work by the rules of light and ſhade, and compoſe his landſcape by the painter's law. But, whilſt the ſun continues to pour forth its light impartially, and the trees to riſe with ſlow progreſſion, it would be ridiculous to attempt it. Let him rather ſeek out, imitate, and aſſociate, ſuch ſtriking paſſages in nature as are immediately applicable to the place to be improved, with regard to rules of landſcape, merely human;—and let him,

> ——————in this and all
> Be various, wild, and free, as Nature's ſelf. MASON.

Inſtead of ſacrificing the natural beauties of the place to one formal landſcape, let every ſtep diſcloſe freſh charms unſought for.

III. Of CHARACTER. Character is very reconcilable with beauty; and, even when independent of it, has attracted ſo much regard, as to occaſion ſeveral frivolous attempts to produce it: ſtatues, inſcriptions, and even paintings, hiſtory and mythology, and a variety of devices, have been introduced for this purpoſe. The heathen deities and heroes have therefore had their ſeveral places aſſigned to them in the woods and lawns of a garden; natural caſcades have been diſfigured with river gods, and columns erected only to receive quotations; the compartiments of a ſum- *Wheatley's Obſervations.* 14 Of emblematical characters.

mer

haracter.

mer houſe have been filled with pictures of gambols and revels, as ſignificant of gaiety; the cypreſs, becauſe it was once uſed in funerals, has been thought peculiarly adapted to melancholy; and the decorations, the furniture, and the environs of a building, have been crowded with puerilities under pretence of propriety. All theſe devices are rather *emblematical* than expreſſive: they may be ingenious contrivances, and recal abſent ideas to the recollection; but they make no immediate impreſſion: for they muſt be examined, compared, perhaps explained, before the whole deſign of them is well underſtood. And though an alluſion to a favourite or well known ſubject of hiſtory, of poetry, or of tradition, may now and then animate or digniſy a ſcene; yet as the ſubject does not naturally belong to a garden, the alluſion ſhould not be principal: it ſhould ſeem to have been ſuggeſted by the ſcene; a tranſitory image, which irreſiſtibly occurred; not ſought for, not laboured; and have the force of a metaphor, free from the detail of an allegory.

15 f imita- re cha- cters.

Another ſpecies of character ariſes from direct *imitation;* when a ſcene or an object, which has been celebrated in deſcription, or is familiar in idea, is repreſented in a garden. Artificial ruins, lakes, and rivers, fall under this denomination. The air of a ſeat extended to a diſtance, and ſcenes calculated to raiſe ideas of Arcadian elegance or of rural ſimplicity, with many more which have been occaſionally mentioned, or will obviouſly occur, may be ranked in this claſs. They are all repreſentations. But the materials, the dimenſions, and other circumſtances, being the ſame in the copy and the original, their effects are ſimilar in both: and if not equally ſtrong, the defect is not in the reſemblance; but the conſciouſneſs of an imitation checks that train of thought which the appearance naturally ſuggeſts. Yet an over-anxious ſolicitude to diſguiſe the fallacy is often the means of expoſing it: too many points of likeneſs ſometimes hurt the deception; they ſeem ſtudied and forced; and the affectation of reſemblance deſtroys the ſuppoſition of a reality. A hermitage is the habitation of a recluſe; it ſhould be diſtinguiſhed by its ſolitude, and its ſimplicity: but if it is filled with crucifixes, hour glaſſes, beads, and every other trinket which can be thought of, the attention is diverted from enjoying the retreat to examining the particulars: all the collateral circumſtances which agree with a character ſeldom meet in one ſubject; and when they are induſtriouſly brought together, though each be natural, the collection is artificial.

16 riginal racters.

But the art of gardening aſpires to more than imitation: it can create *original* characters, and give expreſſions to the ſeveral ſcenes ſuperior to any they can receive from alluſions. Certain properties, and certain diſpoſitions, of the objects of nature, are adapted to excite particular ideas and ſenſations; many of them have been occaſionally mentioned, and all are very well known. They require no diſcernment, examination, or diſcuſſion; but are obvious at a glance, and inſtantaneouſly diſtinguiſhed by our feelings. Beauty alone is not ſo engaging as this ſpecies of character: the impreſſions it makes are more tranſient and leſs intereſting; for it aims only at delighting the eye, but the other affects our ſenſibility. An aſſemblage of the moſt elegant forms in the happieſt ſituations is to a degree indiſcriminate, if they have not been ſelected and arranged with a deſign to produce certain expreſſions; an air of magnificence, or of ſimplicity, of cheerfulneſs, tranquillity, or ſome other general character, ought to pervade the whole; and objects pleaſing in themſelves, if they contradict that character, ſhould therefore be excluded: thoſe which are only indifferent muſt ſometimes make room for ſuch as are more ſignificant; many will often be introduced for no other merit than their expreſſion; and ſome, which are in general rather diſagreeable, may occaſionally be recommended by it. Barrenneſs itſelf may be an acceptable circumſtance in a ſpot dedicated to ſolitude and melancholy.

General Arrangement.

The power of ſuch characters is not confined to the ideas which the objects immediately ſuggeſt; for theſe are connected with others, which inſenſibly lead to ſubjects far diſtant perhaps from the original thought, and related to it only by a ſimilitude in the ſenſations they excite. In a proſpect enriched and enlivened with inhabitants and cultivation, the attention is caught at firſt by the circumſtances which are gayeſt in their ſeaſon, the bloom of an orchard, the feſtivity of a hay field, and the carols of harveſt home; but the cheerfulneſs which theſe infuſe into the mind, expands afterwards to other objects than thoſe immediately preſented to the eye; and we are thereby diſpoſed to receive, and delighted to purſue, a variety of pleaſing ideas, and every benevolent feeling. At the ſight of a ruin, reflections on the change, the decay and the deſolation before us, naturally occur; and they introduce a long ſucceſſion of others all tinctured with that melancholy which theſe have inſpired; or if the monument revive the memory of former times, we do not ſtop at the ſimple fact which it records, but recollect many more coeval circumſtances, which we ſee, not perhaps as they were, but as they are come down to us, venerable with age, and magnified by fame. Even without the aſſiſtance of buildings or other adventitious circumſtances, nature alone furniſhes materials for ſcenes which may be adapted to almoſt every kind of expreſſion: their operation is general, and their conſequences are infinite: the mind is elevated, depreſſed, or compoſed, as gaiety, gloom, or tranquillity, prevails in the ſcene; and we ſoon loſe ſight of the means by which the character is formed; we forget the particular objects it preſents; and giving way to their effects, without recurring to the cauſe, we follow the track they have begun, to any extent which the diſpoſition they accord with will allow. It ſuffices that the ſcenes of nature have a power to affect our imagination and our ſenſibility; for ſuch is the conſtitution of the human mind, that if once it is agitated, the emotion ſpreads far beyond the occaſion: when the paſſions are rouſed, their courſe is unreſtrained; when the fancy is on the wing, its flight is unbounded; and, quitting the inanimate objects which firſt gave them their ſpring, we may be led by thought above thought, widely differing in degree, but ſtill correſponding in character, till we riſe from familiar ſubjects up to the ſublimeſt conceptions, and are wrapt in the contemplation of whatever is great or beautiful, which we ſee in nature, feel in man, or attribute to divinity.

IV. GENERAL ARRANGEMENT. Notwithſtanding the nature of the place, as already obſerved,

Hunting-Box.

ought not to be facrificed to the manſion;—the houſe muſt ever be allowed to be a principal in the compoſition. It ought to be conſidered as the centre of the ſyſtem; and the rays of art, like thoſe of the ſun, ſhould grow fainter as they recede from the centre. The houſe itſelf being entirely a work of art, its immediate environs ſhould be highly finiſhed; but as the diſtance increaſes, the appearance of deſign ſhould gradually diminiſh, until nature and fortuitouſneſs have full poſſeſſion of the ſcene.

Pract. Treat. on Planting and Gardening.

In general, the approach ſhould be to the back front, which, in ſuitable ſituations, ought to lie open to the paſture grounds. On the ſides more highly ornamented, a well kept gravel walk may embrace the walls; to this the ſhaven lawn and ſhrubbery ſucceed: next, the grounds cloſely paſtured; and laſtly, the ſurrounding country, which ought not to be conſidered as out of the artiſt's reach: for his art conſiſts not more in decorating particular ſpots, than in endeavouring to render the whole face of nature delightful.

Another reaſon for this mode of arrangement is, objects immediately under the eye are ſeen more diſtinctly than thoſe at a diſtance, and ought to be ſuch as are pleaſing in the detail. The beauties of a flower can be diſcerned on a near view only; whilſt at a diſtance a roughet of coppice wood, and the moſt elegant arrangement of flowering ſhrubs, have the ſame effect.

Ibid. p. 606.

The moſt rational entertainment the human mind is capable of receiving, is that of obſerving the operations of nature. The foliation of a leaf, the blowing of flowers, and the maturation of fruits, are among the moſt delightful ſubjects that a contemplative mind can be employed in. Theſe proceſſes of nature are ſlow; and except the object fall ſpontaneouſly under the eye of the obſerver, the inconveniences of viſiting it in a remote part, ſo far interfere with the more important employments of life, as to blunt, if not deſtroy, the enjoyment. This is a ſtrong argument in favour of ſhrubs and flowers being planted under or near our windows, eſpecially thoſe from whence they may be viewed during the hours of leiſure and tranquillity.

Ornamented Cottage.

Further, the vegetable creation being ſubject to the animal, the ſhrub may be cropt, or the flower trodden down in its day of beauty. If therefore we wiſh to converſe with nature in private, intruders muſt be kept off,—the ſhrubbery be ſevered from the ground;—yet not in ſuch a manner as to drive away the paſturing ſtock from our ſight. For this reaſon, the ſhaven lawn ought not to be too extenſive, and the fence which incloſes it ſhould be ſuch as will not interrupt the view: but whether it be ſeen or unſeen, ſuſpected or unſuſpected, is a matter of no great import: its utility in protecting the ſhrubs and flowers,—in keeping the horns of the cattle from the window, and the feet of the ſheep from the gravel and broken ground,—in preſerving that neatneſs on the outſide, which ought to correſpond with the finiſhings and furniture within,—render it of ſufficient importance to become even a part of the ornament.

PART II. EXECUTION OF THE GENERAL SUBJECTS.

IMPROVEMENTS in general may be claſſed under the following heads: The *Hunting-Box*, the *Ornamented Cottage*, the *Villa*, and the *Principal Reſidence*.

But before any ſtep can be taken towards the execution of the deſign, be it large or ſmall, a map or plan of the place, exactly as it lies in its unimproved ſtate, ſhould be made; with a correſponding ſketch, to mark the intended improvements upon. Not a hovel nor a twig ſhould be touched, until the artiſt has ſtudied maturely the natural abilities of the place, and has decidedly fixed in his mind, and finally ſettled on his plan, the propoſed alterations: and even then, let him "dare with caution."

1. *Of Improvements adapted to a* Hunting-Box.

Here art has little to do. Hunting may be called the amuſement of nature; and the place appropriated to it ought to be no farther altered from its natural ſtate than decency and convenience require:—With men who live in the preſent age of refinement, "a want of decency is a want of ſenſe."

Ibid. p. 610, &c.

The ſtyle throughout ſhould be *maſculine*. If ſhrubs be required, they ſhould be of the hardier ſorts: the box, the holly, the lauruſtinus. The trees ſhould be the oak and the beech, which give in autumn an agreeable variety of foliage, and anticipate as it were the ſeaſon of diverſion. A ſuite of paddocks ſhould be ſeen from the houſe; and if a view of diſtant covers can be caught, the back-ground will be complete. The ſtable, the kennel, and the leaping-bar, are the factitious accompaniments; in the conſtruction of which ſimplicity, ſubſtantialneſs, and convenience, ſhould prevail.

2. *Of the Style of an* Ornamented Cottage.

Neatneſs and ſimplicity ought to mark the ſtyle of this rational retreat. Oſtentation and ſhow ſhould be cautiouſly avoided; even elegance ſhould not be attempted; though it may not be hid, if it offer itſelf ſpontaneouſly.

Nothing, however, ſhould appear vulgar, nor ſhould ſimplicity be pared down to baldneſs; every thing whimſical or expenſive ought to be ſtudiouſly avoided;—chaſteneſs and frugality ſhould appear in every part.

Near the houſe a ſtudied neatneſs may take place; but at a diſtance, negligence ſhould rather be the characteriſtic.

If a taſte for botany lead to a collection of native ſhrubs and flowers, a ſhrubbery will be requiſite; but in this every thing ſhould be native. A gaudy exotic ought not to be admitted; nor ſhould the lawn be kept cloſe ſhaven; its flowers ſhould be permitted to blow; and the herbage, when mown, ought to be carried off, and applied to ſome uſeful purpoſe.

In the artificial accompaniments, ornament muſt be ſubordinate; utility muſt preſide. The buildings, if any appear, ſhould be thoſe in actual uſe in rural economics. If the hovel be wanted, let it appear; and, as a ſide-ſcreen, the barn and rick-yard are admiſſible; whilſt the

Villa. the dove-houſe and poultry-yard may enter more freely into the compoſition.

In fine, the ornamented cottage ought to exhibit cultivated nature in the firſt ſtage of refinement. It ranks next above the farm-houſe. The plain garb of ruſticity may be ſet off to advantage; but the ſtudied dreſs of the artiſt ought not to appear. That becoming neatneſs, and thoſe domeſtic conveniences, which render the rural life agreeable to a cultivated mind, are all that ſhould be aimed at.

3. *Of the Embelliſhments of a* VILLA.

This demands a ſtyle very different from the preceding. It ought to be elegant, rich, or grand, according to the ſtyle of the houſe itſelf, and the ſtate of the ſurrounding country; the principal buſineſs of the artiſt being to connect theſe two in ſuch a manner, that the one ſhall not appear naked or ſtaring, nor the other deſolate and inhoſpitable.

If the houſe be ſtately, and the adjacent country rich and highly cultivated, a ſhrubbery may intervene, in which art may ſhow her utmoſt ſkill. Here the artiſt may even be permitted to play at landſcape: for a place of this kind being ſuppoſed to be ſmall, the purpoſe principally ornamental, and the point of view probably confined ſimply to the houſe, ſide-ſcreens may be formed, and a fore-ground laid out ſuitable to the beſt diſtance that can be caught.

If buildings or other artificial ornaments abound in the offſcape, ſo as to mark it ſtrongly, they ought alſo to appear more or leſs in the fore-ground: if the diſtance abound with wood, the fore-ground ſhould be thickened, leſt baldneſs ſhould offend; if open and naked, elegance rather than richneſs ought to be ſtudied, leſt heavineſs ſhould appear.

Ibid. It is far from being any part of our plan to cavil unneceſſarily at artiſts, whether living or dead; we cannot, however, refrain from expreſſing a concern for the almoſt total neglect of the principles here in ornamenting the vicinages of villas. It is to be regretted, that in the preſent practice theſe principles ſeem to be generally loſt ſight of. Without any regard to uniting the houſe with the adjacent country, and, indeed, ſeemingly without any regard whatever to the offſcape, one invariable plan of embelliſhment prevails; namely, that of ſtripping the fore-ground entirely naked, or nearly ſo, and ſurrounding it with a wavy border of ſhrubs and a gravel walk; leaving the area, whether large or ſmall, one naked ſheet of green ſward.

In ſmall confined ſpots, this plan may be eligible. But a ſimple border round a large unbroken lawn only ſerves to ſhow what more is wanted. Simplicity in general is pleaſing; but even ſimplicity may be carried to an extreme, ſo as to convey no other idea than that of poverty and baldneſs. Beſides, how often do we ſee in natural ſcenery, the holly, and the fox-glove flouriſhing at the foot of an oak, and the primroſe and the campion adding charms to the hawthorn ſcattered over the paſtured lawn? And we conceive that ſingle trees footed with evergreens and native flowers, and clumps as well as borders of ſhrubs, are admiſſible in ornamental as well as in natural ſcenery.

The ſpecies of ſhrub will vary with the purpoſe. If the principal intention be a winter retreat, evergreens and the early-blowing ſhrubs ſhould predominate; but in a place to be frequented in ſummer and autumn, the deciduous tribes ought chiefly to be planted. Principal Reſidence.

4. *Of the* PRINCIPAL RESIDENCE.

Here the whole art centres. The artiſt has here full ſcope for a diſplay of taſte and genius. He has an extent of country under his eye, and will endeavour to make the moſt of what nature and accident have ſpread before him.

Round a principal reſidence, a gentleman may be ſuppoſed to have ſome conſiderable eſtate, and it is not a ſhrubbery and a ground only which fall under the conſideration of the artiſt: he ought to endeavour to diſcloſe to the view, either from the houſe or ſome other point, as much as he conveniently can of the adjacent eſtate. The love of poſſeſſion is deeply planted in every man's breaſt: and places ſhould bow to the gratification of their owners. To curtail the view by an artificial ſide-ſcreen, or any other unnatural machinery, ſo as to deprive a man of the ſatisfaction of overlooking his own eſtate, is an abſurdity which no artiſt ought to be permitted to be guilty of. It is very different, however, where the property of another intrudes upon the eye: Here the view may, with ſome colour of propriety, be bounded by a woody ſcreen.

The grounds, however, by a proper management, may be made independent of whatever is external; and though proſpects are nowhere more delightful than from a point of view which is alſo a beautiful ſpot, yet if in the environs of ſuch a garden they ſhould be wanting, the elegant, pictureſque, and various ſcenes within itſelf, almoſt ſupply the deficiency.

Mr Wheatley's deſcription of Stowe gardens.

"This (ſays Mr Wheatley) is the character of the gardens at Stowe: for there the views in the country are only circumſtances ſubordinate to the ſcenes; and the principal advantage of the ſituation is the variety of the ground within the incloſure. The houſe ſtands on the brow of a gentle aſcent: part of the gardens lie on the declivity, and ſpread over the bottom beyond it: this eminence is ſeparated by a broad winding valley from another which is higher and ſteeper; and the deſcents of both are broken by large dips and hollows, ſloping down the ſides of the hills. The whole ſpace is divided into a number of ſcenes, each diſtinguiſhed with taſte and fancy; and the changes are ſo frequent, ſo ſudden, and complete, the tranſitions ſo artfully conducted, that the ſame ideas are never continued or repeated to ſatiety.

Theſe gardens were begun when regularity was in faſhion; and the original boundary is ſtill preſerved, on account of its magnificence: for round the whole circuit, of between three and four miles, is carried a very broad gravel walk, planted with rows of trees, and open either to the park or the country; a deep ſunk fence attends it all the way, and comprehends a ſpace of near 400 acres. But in the interior ſcenes of the garden, few traces of regularity appear; where it yet remains in the plantations, it is generally diſguiſed: every ſymptom, almoſt, of formality, is obliterated from the ground; and an octagon baſon in the bottom is now converted into an irregular piece of water, which receives on one hand two beautiful ſtreams, and falls on the other down a caſcade into a lake.

In the front of the houſe is a conſiderable lawn, open to

Principal Reſidence.

to the water: beyond which are two elegant Doric pavilions, placed in the boundary of the garden, but not marking it, though they correſpond to each other; for ſtill further back, on the brow of ſome riſing grounds without the incloſure, ſtands a noble Corinthian arch, by which the principal approach is conducted, and from which all the gardens are ſeen, reclining back againſt their hills; they are rich with plantations; full of objects; and lying on both ſides of the houſe almoſt equally, every part is within a moderate diſtance, notwithſtanding the extent of the whole.

On the right of the lawn, but concealed from the houſe, is a perfect garden ſcene, called the *queen's amphitheatre*, where art is avowed, though formality is avoided. The fore-ground is ſcooped into a gentle hollow. The plantations on the ſides, though but juſt reſcued from regularity, yet in ſtyle are contraſted to each other: they are, on one hand, chiefly thickets, ſtanding out from a wood; on the other, they are open groves, through which a glimpſe of the water is viſible. At the end of the hollow on a little knoll, quite detached from all appendages, is placed an open Ionic rotunda: beyond it, a large lawn ſlopes acroſs the view; a pyramid ſtands on the brow; the queen's pillar, in a receſs on the deſcent; and all the three buildings, being evidently intended for ornament alone, are peculiarly adapted to a garden-ſcene. Yet their number does not render it gay: the duſky hue of the pyramid, the retired ſituation of the queen's pillar, and the ſolitary appearance of the rotunda, give it an air of gravity; it is encompaſſed with wood; and all the external views are excluded; even the opening into the lawn is but an opening into an incloſure.

At the king's pillar, very near to this, is another lovely ſpot; which is ſmall, but not confined; for no termination appears; the ground one way, the water another, retire under the trees out of ſight, but nowhere meet with a boundary. The view is firſt over ſome very broken ground, thinly and irregularly planted; then between two beautiful clumps, which feather down to the bottom; and afterwards acroſs a glade, and through a little grove beyond it, to that part of the lake where the thickets cloſe upon the brink, ſpread a tranquillity over the ſurface, in which their ſhadows are reflected. Nothing is admitted to diſturb that quiet: no building obtrudes; for objects to fix the eye are needleſs in a ſcene which may be comprehended at a glance; and none would ſuit the paſtoral idea it inſpires, of elegance too refined for a cottage, and of ſimplicity too pure for any other edifice.

The ſituation of the rotunda promiſes a proſpect more enlarged; and in fact moſt of the objects on this ſide of the garden are there viſible: but they want both connexion and contraſt; each belongs peculiarly to ſome other ſpot: they are all blended together in this, without meaning; and are rather ſhown on a map, than formed into a picture. The water only is capital; a broad expanſe of it is ſo near as to be ſeen under the little groups on the bank without interruption. Beyond it is a wood, which in one place leaves the lake, to run up behind a beautiful building, of three pavilions joined by arcades, all of the Ionic order: it is called *Kent's Building*. And never was a deſign more happily conceived: it ſeems to be characteriſtically proper for a garden; it is ſo elegant, ſo varied, and ſo purely ornamental: it directly fronts the rotunda, and a narrow rim of the country appears above the trees beyond it. But the effect even of this noble object is fainter here than at other points: its poſition is not the moſt advantageous; and it is but one among many other buildings, none of which are principal.

Principal Reſidence.

The ſcene at the temple of Bacchus is in character directly the reverſe of that about the rotunda, though the ſpace and the objects are nearly the ſame in both: but in this, all the parts concur to form one whole. The ground from every ſide ſhelves gradually towards the lake; the plantations on the further bank open to ſhow Kent's building, riſe from the water's edge towards the knoll on which it ſtands, and cloſe again behind it. That elegant ſtructure, inclined a little from a front view, becomes more beautiful by being thrown into perſpective; and though at a greater diſtance, is more important than before, becauſe it is alone in the view: for the queen's pillar and the rotunda are removed far aſide; and every other circumſtance refers to this intereſting object: the water attracts, the ground and the plantations direct, the eye thither: and the country does not juſt glimmer in the offscape, but is cloſe and eminent above the wood, and connected by clumps with the garden. The ſcene altogether is a moſt animated landſcape; and the ſplendor of the building; the reflection in the lake; the tranſparency of the water, and picturesque beauty of its form, diverſified by little groups on the brink, while on the broadeſt expanſe no more trees caſt their ſhadows than are ſufficient to vary the tints of the ſurface; all theſe circumſtances, vying in luſtre with each other, and uniting in the point to which every part of the ſcene is related, diffuſe a peculiar brilliancy over the whole compoſition.

The view from Kent's building is very different from thoſe which have been hitherto deſcribed. They are all directed down the declivity of the lawn. This riſes up the aſcent: the eminence being crowned with lofty wood, becomes thereby more conſiderable; and the hillocks into which the general fall is broken, ſloping further out this way than any other, they alſo acquire an importance which they had not before; that, particularly, on which the rotunda is placed, ſeems here to be a profound ſituation; and the ſtructure appears to be properly adapted to ſo open an expoſure. The temple of Bacchus, on the contrary, which commands ſuch an illuſtrious view, is itſelf a retired object, cloſe under the covert. The wood riſing on the brow, and deſcending down one ſide of the hill, is ſhown to be deep; is high, and ſeems to be higher than it is. The lawn too is extenſive; and part the boundary being concealed, it ſuggeſts the idea of a ſtill greater extent. A ſmall portion only of the lake indeed is viſible; but it is not here an object: it is a part of the ſpot; and neither termination being in ſight, it has no diminutive appearance: if more water had been admitted, it might have hurt the character of the place, which is ſober and temperate; neither ſolemn nor gay; great and ſimple, but elegant; above ruſticity, yet free from oſtentation.

Theſe are the principal ſcenes on one ſide of the gardens. On the other, cloſe to the lawn before the houſe,

Principal Refidence.

is the winding valley above mentioned: the lower part of it is aſſigned to the Elyſian fields. Theſe are watered by a lovely rivulet; are very lightſome, and very airy, ſo thinly are the trees ſcattered about them; are open at one end to more water and a larger glade; and the reſt of the boundary is frequently broken to let in objects afar off, which appear ſtill more diſtant from the manner of ſhowing them. The entrance is under a Doric arch, which coincides with an opening among the trees, and forms a kind of viſta, through which a Pembroke bridge juſt below, and a lodge built like a caſtle in the park, are ſeen in a beautiful perſpective. That bridge is at one extremity of the gardens; the queen's pillar is at another; yet both are viſible from the ſame ſtation in the Elyſian fields: and all theſe external objects are unaffectedly introduced, diveſted of their own appurtenances, and combined with others which belong to the ſpot. The temple of Friendſhip is alſo in ſight, juſt without the place; and within it are the temples of ancient Virtue, and of the Britiſh worthies; the one in an elevated ſituation, the other low down in the valley, and near to the water: both are decorated with the effigies of thoſe who have been moſt diſtinguiſhed for military, civil, or literary merit; and near to the former ſtands a roſtral column, ſacred to the memory of Captain Grenville, who fell in an action at ſea: by placing here the meed of valour, and by filling theſe fields with the repreſentations of thoſe who have deſerved beſt of mankind, the character intended to be given to the ſpot is juſtly and poetically expreſſed; and the number of the images which are preſented or excited, perfectly correſponds with it. Solitude was never reckoned among the charms of Elyſium; it has been always pictured as the manſion of delight and of joy: and in this imitation, every circumſtance accords with that eſtabliſhed idea. The vivacity of the ſtream which flows through the vale; the glimpſes of another approaching to join it; the ſprightly verdure of the green ſward, and every buſt of the Britiſh worthies reflected in the water; the variety of the trees; the lightneſs of the greens; their diſpoſition; all of them diſtinct objects, and diſperſed over gentle inequalities of the ground; together with the multiplicity of objects both within and without, which embelliſh and enliven the ſcene; give it a gaiety, which the imagination can hardly conceive, or the heart wiſh to be exceeded.

Cloſe by this ſpot, and a perfect contraſt to it, is the alder grove; a deep receſs in the midſt of a ſhade, which the blaze of noon cannot brighten. The water ſeems to be a ſtagnated pool, eating into its banks; and of a peculiar colour, not dirty but clouded, and dimly reflecting the dun hue of the horſe-cheſnuts and alders which preſs upon the brink: the ſtems of the latter, riſing in cluſters from the ſame root, bear one another down, and ſlant over the water. Miſhapen elms and ragged firs are frequent in the wood which encompaſſes the hollow; the trunks of dead trees are left ſtanding amongſt them: and the uncouth ſumach, and the yew, with elder, nut, and holly, compoſe the underwood: ſome limes and laurels are intermixed; but they are not many; the wood is in general of the darkeſt greens; and the foliage is thickened with ivy, which not only twines up the trees, but creeps alſo over the falls of the ground: theſe are ſteep and abrupt: the gravel-walk is covered with moſs; and a grotto at the end, faced with broken flints and pebbles, preſerves, in the ſimplicity of its materials, and the duſkineſs of its colour, all the character of its ſituation: two little rotundas near it were better away; one building is ſufficient for ſuch a ſcene of ſolitude as this, in which more circumſtances of gloom concur than were perhaps ever collected together.

Principal Refidence.

Immediately above the alder-grove is the principal eminence in the gardens. It is divided by a great dip into two pinnacles; upon one of which is a large Gothic building. The ſpace before this ſtructure is an extenſive lawn: the ground on one ſide falls immediately into the dip; and the trees which border the lawn, ſinking with the ground, the houſe riſes above them, and fills the interval: the vaſt pile ſeems to be ſtill larger than it is; for it is thrown into perſpective, and between and above the heads of the trees, the upper ſtory, the porticoes, the turrets, and balluſtrades, and all the flated roofs, appear in a noble confuſion. On the other ſide of the Gothic building, the ground ſlopes down a long continued declivity into a bottom, which ſeems to be perfectly irriguous. Divers ſtreams wander about it in ſeveral directions: the conflux of that which runs from the Elyſian fields with another below it, is full in ſight; and a plain wooden bridge thrown over the latter, and evidently deſigned for a paſſage, impoſes an air of reality on the river. Beyond it is one of the Doric porticoes which front the houſe; but now it is alone; it ſtands on a little bank above the water, and is ſeen under ſome trees at a diſtance before it; thus grouped, and thus accompanied, it is a happy incident, concurring with many other circumſtances to diſtinguiſh this landſcape by a character of cheerfulneſs and amenity.

From the Gothic building a broad walk leads to the Grecian valley, which is a ſcene of more grandeur than any in the gardens. It enters them from the park, ſpreading at firſt to a conſiderable breadth; then winds; grows narrower, but deeper; and loſes itſelf at laſt in a thicket, behind ſome lofty elms, which interrupt the ſight of the termination. Lovely woods and groves hang all the way on the declivities: and the open ſpace is broken by detached trees; which, near the park, are cautiouſly and ſparingly introduced, leſt the breadth ſhould be contracted by them; but as the valley ſinks, they advance more boldly down the ſides, ſtretch acroſs or along the bottom, and cluſter at times into groups and forms, which multiply the varieties of the larger plantations. Thoſe are ſometimes cloſe coverts, and ſometimes open groves: the trees riſe in one upon high ſtems, and feather down to the bottom in another; and between them are ſhort openings into the park or the gardens. In the midſt of the ſcene, juſt at the bend of the valley, and commanding it on both ſides, upon a large, eaſy, natural riſe, is placed the temple of Concord and Victory: at one place its maieſtic front of ſix Ionic columns, ſupporting a pediment filled with bas relief, and the points of it crowned with ſtatues, faces the view; at another, the beautiful colonnade, on the ſide, of 10 lofty pillars, retires in perſpective. It is ſeen from every part; and impreſſing its own character of dignity on all around, it ſpreads an awe over the whole: but no gloom, no melancholy, attends it: the ſenſations it excites are rather.

Principal Reſidence.

ther placid; but full of reſpect, admiration, and ſolemnity: no water appears to enliven, no diſtant proſpect to enrich the view; the parts of the ſcene are large, the idea of it ſublime, and the execution happy; it is independent of all adventitious circumſtances, and relies on itſelf for its greatneſs.

The ſcenes which have been deſcribed are ſuch as are moſt remarkable for beauty or character; but the gardens contain many more; and even the objects in theſe, by their ſeveral combinations, produce very different effects, within the diſtance ſometimes of a few paces, from the uncvenneſs of the ground, the variety of the plantations, and the number of the buildings. The multiplicity of the laſt has indeed been often urged as an objection to Stowe; and certainly, when all are ſeen by a ſtranger in two or three hours, twenty or thirty capital ſtructures, mixed with others of inferior note, do ſeem too many. But the growth of the wood every day weakens the objection, by concealing them one from the other: each belongs to a diſtinct ſcene; and if they are conſidered ſeparately, at different times, and at leiſure, it may be difficult to determine which to take away. Yet ſtill it muſt be acknowledged that their frequency deſtroys all ideas of ſilence and retirement. Magnificence and ſplendor are the characteriſtics of Stowe: it is like one of thoſe places celebrated in antiquity, which were devoted to the purpoſes of religion, and filled with ſacred groves, hallowed fountains, and temples dedicated to ſeveral deities; the reſort of diſtant nations, and the object of veneration to half the heathen world: this pomp is, at Stowe, blended with beauty; and the place is equally diſtinguiſhed by its amenity and its grandeur.

In the midſt of ſo much embelliſhment as may be introduced into this ſpecies of garden, a plain field, or a ſheep-walk, is ſometimes an agreeable relief, and even wilder ſcenes may occaſionally be admitted. Theſe indeed are not properly parts of a garden, but they may be comprehended within the verge of it; and the proximity to the more ornamented ſcenes is at leaſt a convenience, that the tranſition from the one to the other may be eaſy, and the change always in our option. For though a ſpot in the higheſt ſtate of improvement be a neceſſary appendage to a ſeat; yet, in a place which is perfect, other characters will not be wanting: if they cannot be had on a large ſcale, they are acceptable on a ſmaller; and ſo many circumſtances are common to all, that they might often be intermixed; they may always border on each other."

Practical Treatiſe on Planting and Gardening, p. 615.

But on this head it would be in vain to attempt to lay down particular rules: different places are marked by ſets of features as different from each other as are thoſe in men's faces. Much muſt be left to the ſkill and taſte of the artiſt; and let thoſe be what they may, nothing but mature ſtudy of the natural abilities of the particular place to be improved can render him equal to the execution, ſo as to make the moſt of the materials that are placed before him.

Some few general rules may nevertheleſs be laid down. The approach ought to be conducted in ſuch a manner, that the ſtriking features of the place ſhall burſt upon the view at once: no trick however ſhould be made uſe of: all ſhould appear to fall in naturally. In leading towards the houſe, its direction ſhould not be fully in front, not exactly at an angle, but ſhould paſs obliquely upon the houſe and its accompaniments; ſo that their poſition with reſpect to each other, as well as the perſpective appearance of the houſe itſelf, may vary at every ſtep: and having ſhown the front and the principal wing, or other accompaniment, to advantage, the approach ſhould wind to the back front, which, as has been already obſerved, ought to lie open to the park or paſtured grounds. Principal Reſidence.

The improvements and the rooms from which they are to be ſeen ſhould be in uniſon. Thus, the view from the drawing-room ſhould be highly embelliſhed, to correſpond with the beauty and elegance within: every thing here ſhould be feminine, elegant, beautiful, ſuch as attunes the mind to politeneſs and lively converſation. The breakfaſting room ſhould have more maſculine objects in view: wood, water, and an extended country for the eye to roam over; ſuch as allures us imperceptibly to the ride or the chaſe. The eating and banqueting rooms need no exterior allurements.

There is a harmony in taſte as in muſic: variety, and even wildneſs upon ſome occaſions, may be admitted; but diſcord cannot be allowed. If, therefore, a place be ſo circumſtanced as to conſiſt of properties totally irreconcileable, the parts ought, if poſſible, to be ſeparated in ſuch a manner, that, like the air and the recitative, the adagio and the allegro, in muſic, they may ſet off each other's charms by the contraſt.—Theſe obſervations, in the elegant performance whence they are extracted, the author illuſtrates by the following deſcription and propoſed improvement of Perſefield, the ſeat of Mr Morris, near Chepſtow in Monmouthſhire; a place upon which nature has been peculiarly laviſh of her favours, and which has been ſpoken by Mr Wheatley, Mr Gilpin, and other writers, in the moſt flattering terms. Deſcription of Perſefield, *ibid.* p. 616, &c.

"Perſefield is ſituated upon the banks of the river Wye, which divides Glouceſterſhire and Monmouthſhire, and which was formerly the boundary between England and Wales. The general tendency of the river is from north to ſouth; but about Perſefield it deſcribes by its winding courſe the letter S, ſomewhat compreſſed, ſo as to reduce it in length and increaſe its width. The grounds of Perſefield are lifted high above the bed of the river, ſhelving, and form the brink of a lofty and ſteep precipice, towards the ſouth-weſt.

"The lower limb of the letter is filled with Perſe-wood, which makes a part of Perſefield; but it is at preſent an impenetrable thicket of coppice-wood. This dips to the ſouth-eaſt down to the water's edge; and, ſeen from the top of the oppoſite rock, has a good effect.

"The upper limb receives the farms of Llancot, rich and highly cultivated, broken into incloſures, and ſcattered with groups and ſingle trees; two well-looking farm-houſes in the centre, and a neat white chapel on one ſide: altogether a lovely little paradiſaical ſpot. The lowlineſs of its ſituation ſtamps it with an air of meekneſs and humility; and the natural barriers which ſurround it add that of peacefulneſs and ſecurity. The picturesque farms do not form a low flat bottom, ſubject to be overflowed by the river; but take the form of a gorget, riſing fulleſt in the middle, and falling on every ſide gently to the brink of the Wye; except

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except on the eaſt ſide, where the top of the gorget leans in an eaſy manner againſt a range of perpendicular rock; as if to ſhow its diſk with advantage to the walks of Perſefield.

" This rock ſtretches acroſs what may be called the *Iſthmus*, leaving only a narrow paſs down into the fields of Llancot, and joins the principal range of rocks at the lower bend of the river.

" To the north, at the head of the latter, ſtands an immenſe rock (or rather a pile of immenſe rocks heaped one above another) called *Windcliff;* the top of which is elevated as much above the ground of Perſefield as thoſe are above the fields of Llancot.

" Theſe ſeveral rocks, with the wooded precipices on the ſide of Perſefield, form a circular incloſure, about a mile in diameter, including Perſe-wood, Llancot, the Wye, and a ſmall meadow lying at the foot of Windcliff.

" The grounds are divided into the upper and lower lawn, by the approach to the houſe: a ſmall irregular building, ſtanding near the brink of the precipice, but facing down the lower lawn, a beautiful ground, falling ' precipitately every way into a valley which ſhelves down in the middle,' and is ſcattered with groups and ſingle trees in an excellent ſtyle.

" The view from the houſe is ſoft, rich, and beautifully pictureſque; the lawn and woods of Perſefield and the oppoſite banks of the river; the Wye, near its mouth, winding through ' meadows green as emerald,' in a manner peculiarly graceful; the Severn, here very broad, backed by the wooded and highly cultivated hills of Glouceſterſhire, Wiltſhire, and Somerſetſhire. Not one rock enters into the compoſition. The whole view conſiſts of an elegant arrangement of lawn, wood, and water.

" The upper lawn is a leſs beautiful ground, and the view from it, though it command the ' cultivated hills and rich valleys of Monmouthſhire,' bounded by the Severn and backed by the Mendip-hills, is much inferior to that from the houſe.

" To give variety to the views from Perſefield, to diſcloſe the native grandeur which ſurrounds it, and to ſet off its more ſtriking features to advantage, walks have been cut through the woods and on the face of the precipice which border the grounds to the ſouth and eaſt. The viewer enters theſe walks at the lower corner of the lower lawn.

" The firſt point of view is marked by an alcove, from which are ſeen the bridge and the town of Chepſtow, with its caſtle ſituated in a remarkable manner on the very brink of a perpendicular rock, waſhed by the Wye; and beyond theſe the Severn ſhows a ſmall portion of its ſilvery ſurface.

" Proceeding a little farther along the walk, a view is caught which the painter might call a complete landſcape: The caſtle, with the ſerpentine part of the Wye below Chepſtow, intermixed in a peculiar manner with the broad waters of the Severn, forms the fore-ground; which is backed by diſtant hills: the rocks, crowned with wood, lying between the alcove and the caſtle, to the right, and Caſtlehill farm, elevated upon the oppoſite banks of the river, to the left, form the two ſide-ſcreens. This point is not marked, and muſt frequently be loſt to the ſtranger.

" The grotto, ſituated at the head of Perſe-wood, commands a near view of the oppoſite rocks; magnificent beyond deſcription! The littleneſs of human art was never placed in a more humiliating point of view; the caſtle of Chepſtow, a noble fortreſs, is, compared with the natural bulwarks, a mere houſe of cards.

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" Above the grotto, upon the iſthmus of the Perſefield ſide, is a ſhrubbery; ſtrangely miſplaced! an unpardonable intruſion upon the native grandeur of this ſcene. Mr Gilpin's obſervations upon this, as upon every other occaſion, are very juſt. He ſays, ' It is a pity the ingenious embelliſher of theſe ſcenes could not have been ſatisfied with the great beauties of nature which he commanded. The ſhrubberies he has introduced in this part of his improvements I fear will rather be eſteemed paltry.'——' It is not the ſhrub which offends; it is the formal introduction of it. Wild underwood may be an appendage of the grandeſt ſcene; it is a beautiful appendage. A bed of violets or of lilies may enamel the ground with propriety at the foot of an oak; but if you introduce them artificially in a border, you introduce a trifling formality, and diſgrace the noble object you wiſh to adorn.'

" The walk now leaves the wood, and opens upon the lower lawn, until coming near the houſe it enters the alarming precipice facing Llancot; winding along the face of it in a manner which does great honour to the artiſt. Sometimes the fragments of rock which fall in its way are avoided, at other times partially removed, ſo as to conduct the path along a ledge carved out of the rock; and in one inſtance, a huge fragment, of a ſomewhat conical ſhape and many yards high, is perforated; the path leading through its baſe. This is a thought which will hand down to future times the greatneſs of Mr Morris's taſte; the deſign and the execution are equally great; not a mark of a tool to be ſeen; all appears perfectly natural. The arch-way is made winding, ſo that on the approach it appears to be the mouth of a cave; and, on a nearer view, the idea is ſtrengthened by an allowable deception; a black dark hole on the ſide next the cliff, which, ſeen from the entrance before the perforation is diſcovered, appears to be the darkſome inlet into the body of the cave.

" From this point, that vaſt incloſure of rocks and precipices which marks the peculiar magnificence of Perſefield is ſeen to advantage. The area, containing in this point of view the fields of Llancot and the lower margin of Perſe-wood, is broken in a manner peculiarly picturesque by the graceful winding of the Wye; here waſhing a low graſſy ſhore, and there ſweeping at the feet of the rocks, which riſe in ſome places perpendicular from the water; but in general they have a wooded offset at the baſe; above which they riſe to one, two, or perhaps three or four hundred feet high; expoſing one full face, ſilvered by age, and bearded with ivy, growing out of the wrinkle-like ſeams and fiſſures. If one might be allowed to compare the paltry performances of art with the magnificent works of nature, we ſhould ſay, that this incloſure reſembles a prodigious fortreſs which has lain long in ruins. It is in reality one of nature's ſtrong-holds; and as ſuch has probably been frequently made uſe of. Acroſs the iſthmus on the Glouceſterſhire ſide there are the remains of a deep intrenchment, called to this day the

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Bulwark; and tradition ſtill teems with the extraordinary warlike feats that have been performed among this romantic ſcenery.

" From the perforated rock, the walk leads down to the cold-bath (a complete place), ſeated about the mid-way of the precipice, in this part leſs ſteep; and from the cold-bath a rough path winds down to the meadow, by the ſide of the Wye, from whence the precipice on the Perſefield ſide is ſeen with every advantage; the giant fragments, hung with ſhrubs and ivy, riſe in a ghaſtly manner from amongſt the underwood, and ſhow themſelves in all their native ſavageneſs.

" From the cold-bath upward, a coach-road (very ſteep and difficult) leads to the top of the cliff, at the upper corner of the upper lawn. Near the top of the road is a point which commands one of the moſt pleaſing views of Perſefield: The Wye ſweeping through a graſſy vale which opens to the left:—Llancot backed by its rocks, with the Severn immediately behind them; and, ſeen in this point of view, ſeems to be divided from the Wye by only a ſharp ridge of rock, with a precipice on either ſide; and behind the Severn, the vale and wooded hills of Glouceſterſhire.

" From this place a road leads to the top of Windcliff—aſtoniſhing ſight! The face of nature probably affords not a more magnificent ſcene! Llancot in all its grandeur, the ground of Perſefield, the caſtle and town of Chepſtow, the graceful windings of the Wye below, and its conflux with the Severn; to the left the foreſt of Dean; to the right, the rich marſhes and picturesque mountains of South Wales; a broad view of the Severn, opening its ſea-like mouth; the conflux of the Avon, with merchant ſhips at anchor in King-road, and veſſels of different deſcriptions under ſail; Auſt-Cliff, and the whole vale of Berkeley, backed by the wooded ſwells of Glouceſterſhire, the view terminating in clouds of diſtant hills, riſing one behind another, until the eye becomes unable to diſtinguiſh the earth's billowy ſurface from the clouds themſelves."

The leading principle of the improvement propoſed by our author is, to " ſeparate the ſublime from the beautiful; ſo that in viewing the one, the eye might not ſo much as ſuſpect that the other was near.

" Let the hanging walk be conducted entirely along the precipices, or through the thickets, ſo as to diſcloſe the natural ſcenery, without once diſcovering the lawn or any other acquired ſoftneſs. Let the path be as rude as if trodden only by wild beaſts and ſavages, and the reſting places, if any, as ruſtic as poſſible.

" Eraſe entirely the preſent ſhrubbery, and lay out another as elegant as nature and art could render it before the houſe, ſwelling it out into the lawn towards the ſtables; between which and the kitchen-garden make a narrow winding entrance.

" Convert the upper lawn into a deer-paddock, ſuffering it to run as wild, rough, and foreſt-like, as total negligence would render it.

" The viewer would then be thus conducted: He would enter the hanging-walk by a ſequeſtrated path at the lower corner of the lawn, purſuing it through the wood to beneath the grotto, and round the head-land, or winding through Perſe-wood, to the perforated rock and the cold-bath, without once conceiving an idea (if poſſible) that art, or at leaſt that much art, had been made uſe of in diſcloſing the natural grandeur of the ſurrounding objects; which ought to appear as if they preſented themſelves to his view, or at moſt as if nothing was wanted but his own penetration and judgement to find them out. The walk ſhould therefore be conducted in ſuch a manner, that the breaks might be quite natural; yet the points of view obvious, or requiring nothing but a block or ſtone to mark them. A ſtranger at leaſt wants no ſeat here; he is too eager in the early part of his walk, to think of lounging upon a bench

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" From the cold bath he would aſcend the ſteep, near the top of which a commodious bench or benches might be placed: the fatigue of aſcending the hill would require a reſting place; and there are few points which afford a more pleaſing view than this; it is grand, without being too broad and glaring.

" From theſe branches he would enter the foreſt part. Here the idea of Nature in her primitive ſtate would be ſtrengthened: the roughneſſes and deer to the right, and the rocks in all their native wildneſs to the left. Even Llancot might be ſhut out from the view by the natural ſhrubbery of the cliff. The Lover's Leap, however (a tremendous peep), might remain; but no benches, nor other work of art, ſhould here be ſeen. A natural path, deviating near the brink of the precipice, would bring the viewer down to the lower corner of the park; where benches ſhould be placed in a happy point, ſo as to give a full view of the rocks and native wildneſſes, and at the ſame time hide the farm houſes, fields, and other acquired beauties of Llancot.

" Having ſatiated himſelf with this ſavage ſcene, he would be led, by a ſtill ruſtic path, through the labyrinth—when the ſhrubbery, the lawn, with all its appendages, the graceful Wye, and the broad ſilver Severn, would break upon the eye with every advantage of ornamental nature: the tranſition could not fail to ſtrike.

" From this ſoft ſcene he would be ſhown to the top of Windcliff, where in one vaſt view he would unite the ſublime and beautiful of Perſefield."

Only one particular remains now to be noticed. A place which is the reſidence of a family all the year is very defective, if ſome portion of it be not ſet apart for the enjoyment of a fine day, for air, and exerciſe, in winter. To ſuch a ſpot ſhelter is abſolutely eſſential; and evergreens being the thickeſt covert, are therefore the beſt: their verdure alſo is then agreeable to the eye; and they may be arranged ſo as to produce beautiful mixture of greens, with more certainty than deciduous trees, and with almoſt equal variety: they may be collected into a wood; and through that wood gravel-walks may be led along openings of a conſiderable breadth, free from large trees which would intercept the rays of the ſun, and winding in ſuch a manner as to avoid any draft of wind, from whatever quarter it may blow. But when a retreat at all times is thus ſecured, other ſpots may be adapted only to occaſional purpoſes; and be ſheltered towards the north or the eaſt on one hand, while they are open to the ſun on the other. The few hours of cheerfulneſs and warmth which its beams afford are ſo valuable as to juſtify the ſacrifice even of the principles of beauty to the enjoyment of them; and therefore no

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objections of fameneſs or formality can prevail againſt the pleaſantneſs of a ſtraight walk, under a thick hedge or a ſouth wall. The eye may, however, be diverted from the ſkreen by a border before it, where the aconite and the ſnowdrop, the crocus and hepatica, brought forward by the warmth of the ſituation, will be welcome harbingers of ſpring; and on the oppoſite ſide of the walk little tufts of lauruſtines, and of variegated evergreens, may be planted. The ſpot thus enlivened by a variety of colours, and even a degree of bloom, may be ſtill further improved by a green-houſe. The entertainment which exotics afford peculiarly belongs to this part of the year; and if amongſt them be interſperſed ſome of our earlieſt flowers, they will there blow before their time, and anticipate the gaiety of the ſeaſon which is advancing. The walk may alſo lead to the ſtoves, where the climate and the plants are always the ſame. And the kitchen-garden ſhould not be far off; for that is never quite deſtitute of produce, and always an active ſcene: the appearance of buſineſs is alone engaging; and the occupations there are an earneſt of the happier ſeaſons to which they are preparative. By theſe expedients even the winter may be rendered cheerful in a place where ſhelter is provided againſt all but the bittereſt inclemencies of the ſky, and agreeable objects and intereſting amuſements are contrived for every hour of tolerable weather.

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PART III. PRACTICAL GARDENING.

WE now proceed to treat of horticulture or practical gardening. And although it may not appear to be the moſt perfect arrangement; yet as it is probably the moſt convenient and uſeful in the directions to be given for the practical management of the garden, we ſhall conſider the work to be done for each month of the year in the kitchen garden, the fruit garden, the flower garden and the nurſery, under ſo many ſeparate ſections.

JANUARY.

Sect. I. *Kitchen Garden.*

17 Sow radiſhes.

In the beginning, or any time in the courſe of this month, when the weather is open, ſow ſome ſhort-top'd radiſhes on a border expoſed to the ſouth, and protected by a wall or other fence; and about the middle or latter end of the month, you may ſow ſome more of the ſame ſort, and alſo ſome ſalmon radiſhes to ſucceed the ſhort-top'd. The ſeed ſhould be ſown pretty thick at this ſeaſon, becauſe vegetation being ſlow at this period they will be longer expoſed to the depredation of birds, and if the weather prove ſevere, many of them will be cut off after they have appeared above ground. Sow the ſeed evenly over the ſurface, and rake it in with a large wide-toothed rake, or if ſown in beds, cover it with earth to the depth of half an inch from the alleys. A covering of ſtraw about two inches thick would greatly promote their growth, and protect them from froſt and birds. After the plants have come above ground, the covering of ſtraw ſhould be drawn off with a light rake in the early part of the day, and replaced in the evening.

Garden mats are frequently uſed to cover radiſhes, a number of ſmall pins being previouſly ſtuck into the ground to ſupport them an inch or two from the ſurface, and prevent them from preſſing down the young plants. The covering ought to be continued for a longer or ſhorter time, according to the ſeverity of the weather; but when the plants have puſhed out their rough leaves it may ſafely be diſcontinued. Radiſhes ſown under common hot-bed frames, without the aſſiſtance of warm dung, will ſucceed very well, and come on much earlier than thoſe ſown in the open air: due attention, however, muſt be paid to give them air whenever the weather is mild, by raiſing the glaſſes, or removing them altogether during warm days. If wanted very early, recourſe muſt be had to a ſlight hot-bed.

18 Carrots.

At any time in this month, when the weather is mild and dry, let a ſpot of ground in a warm ſituation be prepared for ſowing a few early carrots, by digging the ground a full ſpade deep, and breaking the earth well; and when the ſeed is ſown, let it be raked in. When carrots are wanted very early, they may be reared in a ſlight hot-bed.

19 Spinach.

About the beginning, or any time in the month, when the weather is mild, you may ſow ſome ſpinach; but if the weather will permit, ſome ought to be ſown, both in the beginning and towards the end of the month. The ſmooth-ſeeded or round-leaved ſpinach ſhould chiefly be ſown now. It is preferred, on account of its leaves being thicker, larger, and more ſucculent than the prickly-ſeeded; though ſome of the latter ought alſo to be ſown, becauſe it is hardier, and better able to ſuſtain the ſeverity of the weather. They may be ſown either broadcaſt and raked in, or in ſhallow drills about an inch deep, and nine or ten inches aſunder. It is a frequent practice to ſow ſpinach in drills between the rows of early beans and cabbages.

20 Small ſallad.

You may ſow ſome ſeed of creſs, muſtard, radiſh, rape, &c. and likewiſe ſome lap lettuce in a warm ſituation expoſed to the ſun. They form an agreeable ſalad when cut young. The ground on which they are to be ſown ought to be ſloped to the ſouth, and covered with a common hot-bed frame, which ſhould be ſunk in the ground, ſo far as to allow the glaſſes to approach to within ſix or eight inches of the ſown ſurface.

But ſmall ſalad will ſucceed beſt in a ſlight hot-bed of warm dung formed to the depth of 18 or 20 inches; air muſt be admitted freely, whenever the weather will permit, by raiſing or removing the glaſſes.

21 Parſley.

About the middle, or towards the latter end of the month, ſow parſley ſeed in any dry ſituation, in ſhallow drills nine inches aſunder, and cover it in with earth to the depth of a quarter of an inch, or in ſingle rows along the borders of the kitchen garden. There are two ſorts, the plain-leaved and curled-leaved; the latter is preferred a garniſhing on account of its large buſhy

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leaves, but both are equally good as pot herbs. This ſeed lies very long in the ground before it vegetates.

22 Peas.

Sow ſome early peas in a warm ſituation, to ſucceed thoſe ſown in November and December. The principal early peas are the Charlton hotſpur, golden hotſpur, Reading hotſpur, Maſters hotſpur, &c. the two firſt of which are reckoned the earlieſt. Sow them in rows two feet and a half aſunder, but when they are to be ſupported by ſticks they ought to be three feet aſunder. Some marrowfat peas ſhould likewiſe be ſown at this ſeaſon for a firſt crop of late peas: the dwarf marrowfat is the moſt proper, but any other late pea will ſucceed very well, ſuch as the Spaniſh moratto, tall marrowfat, Pruſſian prolific, ſugar pea, dwarf ſugar, egg pea, pearl pea, &c. Theſe ſhould be ſown in rows three feet aſunder; but when it is intended that they ſhould be ſupported by ſticks, the rows ſhould be three feet and a half apart.

23 Beans.

Any time in the courſe of the month, if the weather be mild, a main crop of beans may be ſown. The Sandwich bean, toker, Windſor, broad Spaniſh, broad long-pod, &c. are the kinds moſt commonly uſed. After the ground has been well dug, put in the beans to the depth of about two inches, with a dibble, in rows three feet apart, and at the diſtance of four or five inches from each other in the rows: or they may be ſown in drills to the ſame depth and diſtance. If no early beans were ſown in November or December, they ought to be ſown the earlieſt opportunity this month: the early Mazagan and Liſbon beans are the beſt. They ought to be planted in a warm border; if at the foot of a ſouth wall, they will come on earlier. Theſe may be planted cloſer than the larger beans, two feet, or two feet and a half, between the rows, being ſufficient. When peas or beans are wanted very early, they may be ſown in hot-beds or ſtoves, and when ſomewhat advanced, they may either be planted out into other hot-beds, into peach and vine-houſes, or into any warm ſituation in the open air.

24 Lettuce.

In the beginning, and again towards the end of the month, you may ſow ſome lettuce. The kinds commonly uſed are the green and white cos, brown Dutch, Cilicia, and common cabbage lettuce. Prepare a piece of ground in a warm ſituation; ſow the ſeeds moderately thick, and rake them in as evenly as poſſible. They may alſo be ſown under hand glaſſes or in common hot-bed frames, to be occaſionally covered with glaſſes or mats: but in either caſe, air muſt be freely admitted, whenever the weather will permit. When wiſhed for very early, they may be ſown in a ſlight hot-bed, and planted out in the open air in March or April.

Take care of lettuce plants which have ſtood the winter.—If you have lettuce plants in frames or under hoops, covered with mats, give them plenty of air when the weather is moderate. Remove all decayed leaves, and deſtroy ſnails which frequently infeſt them; and when the froſt is ſevere, take care to protect them well with mats.

25 Examine cauliflower plants.

The cauliflower plants raiſed laſt autumn, which have ſtood during the winter in frames, ſhould be looked over in open weather. If any decayed leaves appear, pick them off; ſtir up the earth between the plants, and remove all weeds. In mild weather, give them plenty of air during the day, by puſhing down, or removing the glaſſes altogether: but cover them during the night, unleſs when the weather is particularly mild: when it is froſty, or rains much, they ought to be covered during the day. But if the froſt is very ſevere, the frames ſhould be protected at night with a covering of mats, and even during the day, ſhould the froſt be intenſe, without ſunſhine; and ſome ſtraw, dried leaves, or ſomething of that nature, ſhould likewiſe be laid all round the outſide of the frame, to prevent the froſt from penetrating its ſides.

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Cauliflowers under bell and hand glaſſes require the ſame attention: during mild weather, the covers ſhould either be taken off altogether, or raiſed (or tilted) on the ſouth ſide, ſo as to admit the air freely during the day and ſhut again at night, unleſs the weather ſhould be very mild, in which caſe they may remain a little tilted on one ſide; but ſhould intenſe froſt prevail, they ſhould be kept ſhut, and covered with ſtraw or ſomething of that nature. The free admiſſion of the air will prevent the plants from becoming weak, and make them leſs apt to run up to flower before they have acquired ſufficient ſize. In mild winters, ſlugs very frequently injure cauliflower plants; they ought, therefore, to be carefully looked for and deſtroyed.

26 Plant cabbages.

About the end of the month, if the weather is mild, plant out a few early cabbages, on a ſpot of ground well dug and manured with rotten dung, at the diſtance of a foot and a half from each other, or even cloſer, as they are to be cut early, and before they acquire a great ſize. The early York, Batterſea, and ſugar-loaf, are the kinds which ſhould be planted at this ſeaſon.

27 Tranſplant cabbages, &c. for ſeed.

Tranſplant ſome full grown cabbages and ſavoys, for ſeed, about the beginning of the month; though the early part of winter is the moſt proper time for doing ſo. See NOVEMBER.

28 Earth-up celery.

In open dry weather, earth up ſuch celery as has advanced much above ground; let the earth be well broken, and laid up almoſt to the tops of the plants, but care muſt be taken not to bruiſe them. This will afford them protection againſt froſt, which might prove very injurious to them at this ſeaſon.

Where celery is wanted daily, a quantity of ſtraw or ſomething of that nature, ſhould be laid over the rows on the approach of froſt, which will prevent the froſt from penetrating the ground, and on the removal of the covering, the celery may be dug up: or when ſevere weather threatens to ſet in, a quantity of celery may be taken up, placed in ſome ſituation ſheltered from the weather, and covered as far as the blanched part extends with ſand.

29 Blanch endive.

In open dry weather prepare ſome full grown endive for blanching. When the plants are perfectly dry tie up their leaves cloſe together, and they will be completely blanched in about a fortnight. As endive is very apt to rot in wet weather at this ſeaſon, when blanched in the open air, a quantity of it ought to be tranſplanted into a ridge of dry earth, in ſome ſituation where it may be ſheltered from rain.

30 Earth-up peas and beans.

In open dry weather, the earth ſhould be drawn up about ſuch peas and beans as may have advanced an inch or two above ground, which will both ſtrengthen them and protect them againſt froſt.

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If artichokes have not been earthed up before this, that work ſhould now be done the firſt opportunity. See NOVEMBER.

31 Artichokes.

32 Management of muſhroom beds.

Muſhroom beds ought to be well covered at this ſeaſon, and protected both from rain and froſt. The covering of ſtraw ſhould be at leaſt a foot thick, and if the rain ſhould at any time have penetrated nearly through it, it ought to be removed, and a covering of dry ſtraw put in its place; for if the bed ſhould get wet, the ſpawn would be injured, and the future crop deſtroyed.

Sometimes it is deſirable to have ſome of the ordinary kitchen garden crops, at an earlier period, than that at which they are produced in the open air. For this purpoſe recourſe is had to hot-beds; there are likewiſe ſome things reared in the kitchen garden, ſuch as cucumbers and melons, which cannot be obtained in this country without their aid. The principal crops, beſides cucumbers and melons, for which hot-beds may be prepared in this month, are aſparagus, ſmall ſalad, mint, tanſey, peas, and beans for tranſplanting; radiſhes, early carrots, early potatoes, and kidney beans. Hot-beds are formed either of freſh horſe dung, or of tanners bark; the hot-beds uſed this month, as ſeed-beds for early cucumbers and melons, are almoſt always formed of horſe dung. Procure a ſufficient quantity of freſh horſe dung, according to the ſize and number of the hot-beds you mean to form, lay it up in a heap to ferment for ten or twelve days, longer or ſhorter according to the condition of the dung or the ſtate of the weather, during which time it ought to be turned over once or twice with a fork, that it may be thoroughly mixed and equally fermented. After the violent fermentation is over, and the rank ſteam has eſcaped, it will be in proper condition to form a hot-bed. Dung that is very much mixed with ſtraw, or is too dry, ought to be rejected. About a cart-load may be ſufficient for a common hot-bed frame of one light, and ſo on in proportion for one of two or three lights. Hot-beds ſhould be formed in a ſituation ſheltered from the wind, and expoſed to the morning and mid-day ſun. Some dig a trench about a foot deep, and a few inches longer and wider than the frame with which they mean to cover the bed; others form hot-beds on the ſurface of the ground. At this ſeaſon of the year the laſt mode is to be preferred, becauſe it affords an opportunity of lining the bed with freſh hot dung quite down to the bottom, to augment the heat when it declines; in this way water is likewiſe prevented from ſettling about the bottom of the bed, which is often the caſe, when the bed is formed in a trench, which would inevitably check the fermentation, and conſequently deſtroy the heat of the bed. Mark out a ſpace on the ground, a few inches longer and wider than the frame which you intend to put on the bed. Spread the dung when in proper condition, regularly with a fork, beating it down gently from time to time with the fork; when the dung is trodden down, it is apt to heat too violently, and does not ſucceed ſo well as when the dung is allowed to ſettle gradually. The dung ought to be raiſed to three feet and a half, or thereabouts. In this way hot-beds may be formed, which will preſerve their heat for a conſiderable time: When ſlighter hot-beds are required, the dung may be raiſed to one foot and a half, or two feet: theſe light hot-beds anſwer very well for raiſing early crops.

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33 Sow cucumber and melon-ſeeds.

Having prepared a hot-bed according to the directions juſt given for a larger or ſmaller frame, in proportion to the quantity of ſeed you intend to ſow, ſuch a one as may be covered with a frame of one light will be ſufficient to raiſe plants for an ordinary crop. Let the frame and lights be put on, and kept cloſe, till the heat begin to riſe, then raiſe the glaſs, that the ſteam may paſs off. Three or four days after the bed has been formed, it may be covered with earth prepared for that purpoſe, to the depth of about three inches; before the earth is put on, if the dung ſhall have ſettled unequally, the ſurface of the bed ought to be made perfectly level. Rich light dry earth is beſt adapted to this purpoſe: that it may be dry enough, it ought to have been protected from the rain by ſome ſhade during the winter; for, ſhould it be wet, it is apt to prevent the ſeeds from germinating, or to injure the young plants. Fill two or three ſmall flower-pots with ſome of the ſame earth, and place them in the hot-bed till the earth in them be warmed, and then ſow the ſeeds.

Sow the ſeeds, and cover them about half an inch deep; the bottom of the pots ought to be plunged a little way into the earth with which the bed is covered, ſome of which ought to be drawn up round the pots. A few days after ſowing the ſeeds in the pots, ſome ſeeds may be ſown in the earth of the bed. By ſowing in pots, if the bed ſhould overheat (which is ſometimes the caſe) you have it in your power to withdraw and remove the pots out of danger.

After ſowing the ſeeds, put on the lights; when the ſteam riſes copiouſly, give the hot-bed air by raiſing the glaſſes a little. The hot-bed ought to be covered every evening about ſunſet with mats, which ſhould be taken off again in the morning about nine o'clock, ſooner or later according to the ſtate of the weather. A ſingle mat will be ſufficient at firſt, as the warmth of the bed will be ſtrong. The ends of the mats ought not to hang down over the ſides of the frame, becauſe the rank ſteam proceeding from the bed would be confined, and might injure the plants. The plants will appear, in two or three days after the ſeeds have been ſown, when care muſt be taken to raiſe the glaſſes a little to admit freſh air, and to allow the ſteam of the bed to eſcape; if this be not properly attended to, and if the beds be kept too cloſe, the plants will either be deſtroyed altogether, or become weak and yellowiſh. About the time the firſt ſown ſeeds appear above ground, a few more ought to be ſown in the earth of the bed. As thoſe tender plants are liable to ſuffer from various cauſes at this ſeaſon, it would be proper to ſow a little ſeed at three different periods, at ſhort intervals, that if one ſowing ſhould miſcarry, another may ſucceed. Three or four days after the plants have come up, they ought to be planted out into ſmall pots.

The day before the plants are to be tranſplanted, pots filled with light rich dry earth ſhould be put into the bed, that the earth which they contain may be brought to a proper temperature. Take the plants carefully up, raiſing them with your finger and thumb, with all the roots as entire as poſſible, and with as much of the earth as will readily adhere about the fibres. Plant three cucumbers and two melons in each pot, and draw the earth well up about the ſtems. If the earth in the pots be very dry, a little water ſhould be given

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given after the tranſplanting has been finiſhed. The pots ought to be plunged cloſe to one another in the earth of the bed, and all the ſpaces between them ought to be carefully filled with earth, to prevent the rank ſteam of the dung from riſing up, which would certainly kill the plants. The bed ought to be carefully examined every day to ſee that the roots of the plants do not receive too much heat. If any thing like that appear, draw up the pots a little, taking care to replunge them to the rim after the danger is over. When the plants are fairly rooted, if the earth appears dry, give them a little water in the warmeſt time of the day; let the watering be occaſionally repeated very moderately, according as the earth in the pots becomes dry. All the water given to the plants at this ſeaſon ought to ſtand for a few hours within the bed, that it may acquire the ſame temperature with the earth in which the plants grow, as very cold water would chill the plants too much. In order to preſerve a proper heat in the bed as long as poſſible, the ſides of it ought to be covered with ſtraw or dry leaves, which will defend the bed from cold piercing winds, heavy rains, and ſnow. Should the bed be unprotected when any of theſe prevail, the heat would be diminiſhed, and the plants receive a check. If a lively heat be kept up, you may admit air to the plants every day, by raiſing the glaſſes in proportion to the heat of the bed and temperature of the external air. If the air be very cold, it will be neceſſary to fix a piece of mat or ſome ſuch thing to the edge of the ſaſh, which may hang down over the opening, and prevent the cold air from ruſhing too freely into the bed. About a fortnight after the bed has been formed, it ought to be examined carefully, to diſcover whether the heat of the bed ſtill continues ſtrong enough; if not, the dry leaves and ſtraw ought to be removed from the front and back of the bed if any had been placed there, and a quantity of freſh horſe dung ſhould be ſupplied. The lining thus applied ſhould not exceed 15 or 18 inches in thickneſs, and ſhould be raiſed a few inches higher than the bed. When too thick a lining is applied, it is apt to throw in too great a heat, and injure the plants. A quantity of earth ſhould be laid on the top of the dung thus applied to the depth of two inches, to keep down the rank ſteam. The lining will ſoon increaſe the heat of the bed, and maintain it for ten days or a fortnight longer. At the expiration of that time, when the heat begins to fail, the two ſides of the bed ſhould receive a lining of the ſame thickneſs, which will again augment the heat of the bed, and preſerve it in good condition for upwards of a fortnight longer. By lining firſt the one ſide and then the other at the interval of about a week or ten days, the heat of the bed may be made to laſt longer than when both linings are applied at the ſame time. Either method may be followed, according to the degree of external cold which may prevail, or according to the degree of warmth required to be maintained in the bed. After performing the lining, if very cold, wet, or ſnowy weather prevail, it may be proper to lay a quantity of long dry litter all round the general lining, which will protect the whole of the bed, and keep it in a proper temperature. By the proper management of this ſeed-bed, and by the due application of linings, the growth of young plants may be promoted till they are fit to be planted out into other hot-beds, where they are to remain and produce fruit. Where there is plenty of hot dung and every other convenience, a ſecond bed may be prepared, into which the young plants may be transferred and nurſed till they become perfectly fit for final tranſplantation. Due attention muſt be paid to have this ſecond nurſery-bed in proper condition for the reception of the pots containing the young plants. It is to be formed, earthed over, and taken care of, according to the directions given for the management of the ſeed-bed. When the plants have got their two firſt rough leaves, two or three inches broad, and have puſhed out their two firſt running buds, they are in a proper ſtate for planting out into larger hot-beds. For the farther managements of cucumbers and melons, ſee FEBRUARY.

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It is proper that none but ſuch ſeeds, both of cucumbers and melons, as have been kept for ſome time, ſhould be ſown; thoſe which have been kept for two or three years are to be preferred, becauſe the plants which proceed from them are thought to be, not only more fruitful, but to produce their fruit ſooner. Plants which are produced from recent ſeeds commonly puſh vigorouſly, and their ſhoots grow to a great length before they ſhow a ſingle fruit. The beſt ſorts of cucumbers for producing an early crop, are the early ſhort prickly and long green prickly; the former of theſe is the earlier, the other produces the beſt crop and the largeſt fruit. There are ſeveral ſorts of melons ſown for an early crop, viz. the romana, cantaloupe, polignac, &c. The romana is a very good bearer, and produces early, and is a very well-flavoured, though ſmall fruit. The cantaloupe is a very well-flavoured melon, acquires a good ſize, and ripens early. The polignac is alſo a very good melon. It is better, however, to ſow two or three kinds, if they are eaſily to be had, for the ſake of gaining greater variety.

Hot-beds may be formed any time this month for forcing aſparagus: they are to be formed in the ſame way as hot-beds for cucumbers and melons; the dung, however, need not be raiſed to the ſame height, from two and an half to three feet will be ſufficient. After a bed has been formed, it ſhould be covered with earth to the depth of ſix or ſeven inches, and the aſparagus plants immediately put in; but the frame and glaſſes are not to be put on till after the violent heat of the bed ſhall have ſubſided, and the rank ſteam eſcaped. A ſufficient quantity of aſparagus plants, proper for forcing, muſt be provided; viz. ſuch as have been raiſed from ſeed and planted out in the open ground for two or three years, as directed elſewhere; ſix hundred will be ſufficient for a frame of three lights, and ſo on in proportion, for a larger or ſmaller frame. The ſtrongeſt and moſt vigorous plants ought to be choſen, and ſhould be planted very cloſe together, that the quantity produced may repay the trouble and expence of forcing. Having marked the ſize of the frame on the ſurface of the bed, raiſe a ridge of earth a few inches high, againſt which place the firſt row of plants, and draw a little earth over the roots of each; next to them another row may be planted as cloſe as poſſible, and ſo on till the whole ſpace is covered, ſome moiſt earth ſhould be applied all round the outſide of the ſpace, occupied by the plants, and raiſed an inch or two above their tops. Then the whole ſhould be covered with a

quantity

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quantity of rich light earth, to the depth of about two inches, and left in that ſituation till the buds begin to appear above ground. They ſhould then receive an additional covering of rich light earth to the depth of three or four inches. A wreath of ſtrong ſtraw band is previouſly fixed by ſome round the bed, which both ſupports the laſt covering of earth and the frame. The ſtraw ropes ſhould be about four inches thick, and fixed down all round the edge of the bed, exactly in that place where the frame is to be put. Should there be no reaſon to ſuſpect overheating or burning, the frame may be immediately put on; care ſhould be taken to raiſe up or ſhove down the glaſſes to allow the rank ſteam to eſcape, particularly about the time the buds begin to appear. If much rain or ſnow ſhould fall after the bed has been formed, and before the frame is put on, it will be neceſſary to cover the bed with mats or with ſtraw. The heat of the bed likewiſe during that time ſhould be carefully examined; with that view, two or three ſticks, called *watch ſticks*, ſhould be ſtuck in the dung, to be pulled out occaſionally, and examined by applying the hand to their extremities; or the heat may be better regulated by the agricultural thermometer, invented and conſtructed by Mrs Lovi of Edinburgh. If there be danger of burning, it is moderated by boring ſeveral wide holes in the dung on each ſide of the bed, and in the earth immediately under the roots of the plants, to admit air, and let the rank ſteam paſs off: theſe holes ſhould be ſhut after the heat of the bed is become moderate. The outſide of the bed ſhould be protected in wet, or cold windy weather, and when its heat decays, it is revived by means of lining, as directed in cucumber and melon beds. After the aſparagus begins to appear above ground, due attention ſhould be paid to the regular admiſſion of air, whenever the weather is at all moderate; and care muſt be taken to cover the beds with mats during ſevere weather, and conſtantly during the night. In four or five weeks after the formation of the bed, the aſparagus will be fit for cutting, and will continue to produce abundantly for two or three weeks longer. During that time three or four hundred may be collected every week from a three light frame. They muſt not be cut, as is the caſe when aſparagus is collected in the open air, the fingers muſt be introduced into the earth, and the buds are to be broken off cloſe to the roots.

34 Sow carrot.

When carrots are required early, make a hot-bed about two feet thick of dung, and cover it to the depth of ſix inches with light rich earth. Sow the ſeed thin, and cover it to the depth of a quarter of an inch. Admit air freely in mild weather through the day, and cover them during the night. When about an inch or two high, thin them to about three inches aſunder, they will be fit for drawing in April or May.

Sow rape, creſſes, muſtard, and radiſh, in a ſlight hot-bed. The dung ſhould not exceed the thickneſs of eighteen inches or two feet, and ſhould be covered with five or ſix inches of light dry earth. The ſeeds may be ſown very thick, either in drills or all over the ſurface of the bed, and covered ſlightly. The bed ſhould be covered with a frame and glaſſes, and protected during the night and ſevere weather, with mats. Whenever the weather will permit, air muſt be admitted, otherwiſe the plants will be apt to die as faſt as they come up.

Where mint, tanſey, and terragon, are required very early, a ſlight hot-bed may be prepared and covered with earth to the depth of five or ſix inches, in which the roots of mint, tanſey, and terragon, may be planted and covered with a frame and glaſſes.

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35 Early peas and beans.

About the beginning of this month, ſome peas and beans may be ſown in a hot-bed, either for tranſplanting into a warm border in the open air, or into other hot-beds where they are to remain, and produce a crop; the early framing pea is beſt for this purpoſe.

36 Early potatoes.

A hot-bed may be formed, in which ſome early dwarf potatoes may be planted, either to be planted out afterwards, or to remain to produce a crop.

37 Early kidney beans.

Sow ſome early kidney beans in a hot-bed, or in pots to be placed in a hot-houſe. Fill moderate ſized pots (24s) with rich light earth, and ſow three or four beans in each pot. When the plants have come up, give them a moderate quantity of water; they will produce a crop in March and April.

SECT. II. *Fruit Garden.*

38 Apple and pear trees to be pruned.

IF any apple or pear trees remain unpruned on walls or eſpaliers, that work may be performed any time this month, even though the weather ſhould be froſty; ſome people indeed think it improper to prune trees during froſt, leſt the trees ſhould receive injury by having their cut ſurfaces expoſed to the action of the froſt; but their apprehenſions are chimerical.

Apple and pear trees produce their flower buds on ſhort branches, (or ſpurs as they are termed), which proceed from the ſides of the branches of one or more years ſtanding, and which every year increaſe in number, while the branches from which they proceed continue vigorous: if theſe branches, which throw out ſpurs, be ſhortened or cut at their extremities, they commonly puſh out a number of ſmaller branches, which acquire conſiderable length, but form no flower buds; it is therefore proper in pruning theſe trees, to take care never to ſhorten a leading branch where there is room on the wall or eſpalier to allow it to be extended, unleſs when a ſupply of new wood is wanted to fill up a vacancy. In young trees which have not yet formed a ſufficient head, ſelect the moſt vigorous and beſt placed ſhoots, and train them to the wall or eſpalier, at the diſtance of from four to ſix inches from one another; any branches that intervene between them are to be removed cloſe to their origin, and all thoſe branches which do not apply well to the wall or eſpaliers may likewiſe be removed. When the branches are too thin, and a ſupply of wood is wanted, one or more of the laſt year's ſhoots may be cut down to within a few inches of its origin; four or five buds are commonly left. Theſe branches ſo ſhortened, commonly puſh out three or four ſhoots the enſuing ſeaſon. The young branches that have been laid in at full length, will in two or three years produce a good many ſpurs or ſhort branches along their ſides, from which a crop of fruit may be expected. In old trees, that have been already trained, all the vigorous bearing branches are to be retained, unleſs where they may happen to be too crowded, then the branch intended to be removed ſhould be cut out cloſe to its inſertion. When any of the old bearing branches ſeem to be worn out, or decayed, they ſhould be pruned out near

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near to their inſertion; from the ſtump that is left ſome ſhoots will be puſhed out the following ſeaſon, the beſt of which may be retained, to ſupply the place of the branch removed. All the leading branches ought to be looked over, and the ſuperfluous fore-right and miſplaced ſhoots of laſt year's growth which will not eaſily apply to the wall, ought to be cut off cloſe to their inſertion into the main branch; the moſt vigorous and beſt placed ſhoots ſhould be trained at full length to the wall or eſpalier at the diſtance of from four to ſix inches from one another. When there happens to be any vacant ſpace on the wall or eſpalier, ſome of the laſt year's ſhoots may be ſhortened, as directed in the pruning of young trees.

In looking over the leading branches, all the ſpurs which produce flower buds ought to be carefully retained; and any ſtumps which may have been left, after former prunings, ought to be cut away quite cloſe to the branch from which they proceed, for they conſtantly produce a redundancy of branches which create confuſion, ſhade the fruit from the ſun, and rob it of its proper nouriſhment.

39 Plum and cherry.

This is a proper ſeaſon to prune plum and cherry trees either on walls or eſpaliers: the ſame directions which have been given for pruning apples and pears will apply to the pruning of plums and cherries, as they likewiſe produce their fruit on ſpurs, puſhed out from nearly the extremity of the ſhoots, which are two or three years old. It is improper in pruning to ſhorten the branches, becauſe the very part would be removed from which the fruit buds ſhould proceed next or ſubſequent ſeaſon.

40 Peach, nectarine, &c.

Theſe trees produce their fruit on the young branches of laſt year. A plentiful ſupply of laſt year's ſhoots muſt therefore be retained to be nailed to the wall, at the diſtance of from three inches to half a foot from one another; the moſt vigorous and beſt placed ſhoots are to be ſelected for this purpoſe, and all fore-right, weakly or ſuperfluous ſhoots are to be removed, likewiſe ſome of the laſt year's bearers. That the pruning knife may be uſed more freely, it would be proper not only to unnail the ſhoots which had been laid in laſt year, but even ſome of the principal branches. In ſelecting the branches, attention muſt be paid not only to their poſition and proper diſtance, but likewiſe to the quantity of flower buds they contain. Theſe buds are diſtinguiſhable from thoſe which produce branches by their roundneſs; and towards ſpring when the buds begin to ſwell, by their ſize: thoſe which produce branches being generally ſmall, flat, and pointed. It frequently happens that one of each is produced at the ſame eye (as it is termed), or ſometimes two flower buds, with a branch bud between them. All very ſtrong thick branches are to be rejected, as well as thoſe that are long, ſmall, and feeble, becauſe the very vigorous branches are much more apt to run to wood, than to produce fruit. Thoſe branches which are ſelected as the fitteſt to be retained, ought to be ſhortened (due regard being paid to their vigour, and to the number and ſituation of the flower buds they contain), which will make them puſh out two or three branches the enſuing ſummer, the beſt of which may be retained for next year's bearers.

In weak trees that are not diſpoſed to puſh vigorouſly, the ſmaller ſhoots may be ſhortened to the length of ſix or eight inches; the more vigorous ſhoots may be left from ten to fifteen inches long, or thereby. In trees of moderate growth the branches ought to be left proportionally longer, the ſmaller ones from half a foot to ten inches, the more vigorous from one foot to a foot and a half. In very vigorous trees, the branches ought to be ſhortened but little, and ſome of them not at all, the ſmaller ſhoots may be ſhortened to the length of a foot or fifteen inches; the more vigorous ſhoots ſhould have only about a third or fourth part o their length cut off; and the moſt vigorous ſhould not be ſhortened at all, for the more they are ſhortened, the more they are diſpoſed to puſh vigorouſly and run to wood, and on that account produce few fruit. As the flower buds are ſometimes ſituated near the extremity, at other times near the bottom of the branch, this circumſtance in a certain degree muſt regulate the ſhortening the branch, as care muſt be taken to leave a ſufficient quantity of flower buds, where fruit is the object. Care muſt likewiſe be taken to have a bud which is expected to produce a branch, at the eye which is next the cut extremity; it is of no moment whether it be alone or in company with one or two flower buds, but it is abſolutely neceſſary to have one to produce a leading branch, without which the fruit will not thrive. When three or four laſt year's ſhoots are found on a branch of the preceding year, the one at the upper and lower extremities is frequently preſerved; in that caſe the intermediate ones ought to be cut away cloſe to the branch: but ſhould any of the intermediate ones be ſelected as the moſt proper to be retained, the branch of the preceding year ſhould be cut off cloſe by the uppermoſt of the ſhoots which has been fixed on, and all thoſe ſhoots which are to be removed ſhould be cut away cloſe to the branch from which they proceed. After each tree has been gone over, it ought to be carefully nailed to the wall or fixed to the eſpalier.

January. Fruit Garden.

41 Vines and figs.

Vines if cut when in a growing ſtate are apt to bleed very copiouſly. This bleeding is detrimental to them, and is ſtopt with great difficulty. If vines are pruned a ſhort time before the riſe of the ſap, they are likewiſe liable to bleed at the recently cut extremities; it would therefore be improper any time this month to prune vines which grow in the hot-houſe or in a vinery which is to be early forced; but ſuch as grow on open walls or in vineyards may be ſafely cut any time this month. Though it would certainly be adviſeable to prune as ſoon after the fall of the leaf as may be, as in that caſe the cut extremities would have ſufficient time to heal, and all danger of bleeding would be removed.

Fig trees may be pruned any time this month, though perhaps it would be as well to defer it till next or following month. For the method, ſee FEBRUARY.

Gooſeberries and currants may ſtill be pruned. See NOVEMBER.

42 Plant gooſeberries and currants.

Gooſeberries and currants may be planted if the ſeverity of the froſt does not render the ground too hard; indeed they may be planted any time from the fall of the leaf in autumn till the puſhing out of their buds in ſpring. It is uſual to plant them in rows along the borders, or to divide the plots in the kitchen garden; in which caſe they ought to be planted two or three yards apart, and the diſtance between the rows muſt depend on the ſize of the plots they are to ſeparate (10, 15 or 18 yards). They ought to be trained up with a ſingle

January. Fruit Garden.

ſingle ſtalk to the height of 10 or 15 inches, which will allow the kitchen crops that may be planted near them to grow freely, and will render the operations of hoeing, weeding, and raking under the buſhes eaſy. They are frequently planted out in compartments by themſelves, in which caſe the buſhes ought to ſtand at the diſtance of from five to eight feet in the rows, and the rows ought to be eight or nine feet apart.

When plenty of room is allowed between the buſhes, they grow freely, and produce larger fruit; free admiſſion is likewiſe afforded to the ſun and air, without which, the fruit would not acquire its proper flavour: hoeing, and digging between the buſhes, is more eaſily performed, and crops of different kinds of kitchen garden productions may be reared in the intervals. Currants are very frequently planted againſt walls and rails, to which they are regularly trained. Gooſeberries alſo are ſometimes planted againſt walls and rails, thoſe againſt walls yield early and well-flavoured fruit. The variety of gooſeberries is very great, and every ſeaſon adds new varieties to thoſe already known. The principal kinds are the early rough green, ſmall early red, ſmooth green, large Dutch red, common hairy red, ſmooth black, rough white, white cryſtal, large yellow, rough yellow, large amber, large tawney, &c.

The different kind of currants are the black, common white, large Dutch white or grape currant, common red and champaigne.

43 Raſpberries.

Raſpberries may be pruned or planted during this or any of the winter months; they produce their fruit on ſmall branches which proceed from the ſhoots of the former year. Every year they puſh up a number of ſhoots from the root, which bear fruit the ſubſequent ſummer, and then die. In dreſſing raſpberries, all the old dead ſtalks muſt be cut away cloſe by the ground, and all the young ones except four or five of the ſtrongeſt, which ſhould be ſhortened a little. All theſe ſhoots become ſmall towards their extremity and bend a little; it is the common practice to cut off the bent part, but ſome ſhorten them one-third, others one-fourth. After the ſhoots have been ſhortened, they ought to be intertwined or ſurrounded by a bandage of ſome kind to keep them together, for the ſake of mutual ſupport, becauſe when they are allowed to ſtand ſingle they are apt to be weighed down in ſummer by the weight of their own leaves and fruit, particularly when loaded with rain, or to be beaten down by the wind; in which caſe they may frequently lie one over the other, create confuſion, and exclude the ſun and air from thoſe that are undermoſt, or may lie ſo cloſe to the ground as to have their fruit deſtroyed. After the plants are pruned, the ground between them ought to be dug, and all ſtraggling ſhoots which advance to a diſtance from the main plants ought to be taken up.

Raſpberries may be planted any time this month when the weather is moderate: when new plantations of them are wanted, they ought to be formed in open ſituations, if high-flavoured fruit be wiſhed for; but raſps will thrive very well and produce good crops in ſhadowy ſituations. The ground in which they are to be planted ought to be well dug, and if a little rotten dung be added, the plants will ſucceed the better. They ought to be planted at the diſtance of three feet from each other, in rows four or five feet apart. The offsets which are dug up from between the rows of old plantations of raſpberries are commonly made uſe of for this purpoſe. Any of the laſt years ſhoots that are well rooted and tolerably vigorous will anſwer perfectly well. Thoſe which have two or three buds, formed on the roots, from which young ſhoots are to proceed the following ſummer, are generally to be preferred to thoſe which have fewer though equally vigorous. They ought to be taken up carefully with all their roots, and after the ſtem has been ſhortened a little (about one-third) they may be planted at the diſtances already mentioned. Plantations formed now will yield ſome fruit the enſuing ſummer, and a plentiful crop the following ſeaſon. The kinds of raſpberries commonly uſed are the white, double bearing, (which bears two crops, one in ſummer the other in autumn), the ſmooth ſtalk, the Antwerp (very large).

January. Fruit Garden.

44 Prepare for planting fruit trees.

If the weather be mild, all kind of fruit trees may be planted any time this month; but if it ſhould be deemed more adviſeable to defer planting till next month, the ground may be prepared for their reception any time during open weather. The borders on which fruit trees are to be planted, which are to be trained againſt walls or eſpaliers, ſhould be trenched or dug two ſpades deep. For planting and preparing ground for fruit trees, ſee OCTOBER.

45 Protect the roots, &c.

The roots of the more tender ſorts of fruit trees, viz. peaches, nectarines, apricots, and indeed of all ſorts of ſtoned fruit, which may have been planted any time in the courſe of the winter, will require to be protected during froſt by a covering of ſtraw, or litter mixed with dung, or ſomething of that nature, applied to a conſiderable diſtance round the ſtem, ſo as to cover the ground completely, and prevent the froſt from penetrating.

Protect fig trees during froſty weather with a covering of mats, or ſomething of that nature, becauſe their ſhoots being ſucculent, particularly towards their extremities, are apt to be deſtroyed by the froſt. This is of the more conſequence as the fruit is produced from the young ſhoots only, and chiefly from their extremities, the parts moſt liable to ſuffer.

46 Force fruit trees

Where there are vineries, peach, cherry-houſes, &c. the glaſſes ought to be put on about the beginning of the month when it is intended to force early, and fires ought to be applied about the middle or towards the end of it See *Forcing*, FEBRUARY.

47 and ſtrawberries.

Towards the beginning, middle, or end of the month, hot-beds may be made for forcing ſtrawberries, which, if properly managed, will produce ripe fruit in March or April. The hot-beds are to be formed according to the directions given under the article *Melon*, and *Cucumber*. See *Kitchen Garden*, JANUARY. The dung ſhould be raiſed at leaſt to the height of three feet, and the frame and glaſſes put on as ſoon as the bed is made, which will both protect it from rain or ſnow, and draw up the ſteam ſooner. As ſoon as the violent heat is over, the ſurface of the bed ſhould be covered to the depth of four or five inches with dry earth, or with a quantity of decayed tanners bark taken from an old tan-bed. The pots containing the plants ſhould be plunged up to the rims into the earth or tan with which the bed is covered. They ſhould be placed as cloſe together as poſſible, and care taken to fill up all the interſtices with earth or tan. When all the pots are plunged, put on the glaſſes and keep them cloſe till the

January. Flower Garden.

the ſteam riſe in the bed, when it will be neceſſary to raiſe them a little behind, to allow the ſteam to paſs off. The alpine and ſcarlet ſtrawberry are commonly made uſe of for this purpoſe.

The plants ſhould be two years old, and if potted the preceding autumn, they will ſucceed the better; but if a quantity of plants were not put into pots laſt autumn for this purpoſe, that work may be done any time this month during open weather. For the method, ſee SEPTEMBER. Or the plants may be taken up now with balls of earth, and placed in the beds without being put into pots. When the plants begin to puſh, let them have plenty of air during favourable weather, for ſhould they be kept too cloſe they will become weakly, and either produce no flowers at all, or their flowers will drop off without yielding fruit. They ſhould likewiſe be frequently watered and protected during the night in ſevere weather with a covering of mats. When the heat of the bed begins to decay, it ſhould be renewed by proper linings of freſh dung, applied as directed for melon-beds. As to the ſize of hot-beds nothing need be ſaid, as that muſt be regulated by the number of plants intended to be forced. Hot-beds formed of tanners bark, particularly where there are pits conſtructed on purpoſe, will anſwer better than thoſe of horſe-dung, becauſe they afford a more equable heat. Where there are pine houſes, or hot-houſes of any kind, plenty of ſtrawberries may be obtained early, without much trouble, by placing pots filled with the plants in them anywhere near the glaſs.

SECT. III. *The Flower Garden or Pleaſure Ground.*

48 Protect flowers in pots.

DOUBLE flowers, as ſweetwilliams, wallflowers, ſtocks, roſe campion, and auriculas, carnations, &c. kept in pots ought to be protected in ſevere weather, either by common garden frames, or by coverings of mats ſupported on hoops. Due attention muſt be paid to give them air whenever the weather is mild. Where there are no conveniences of the above deſcription, the pots may be plunged up to their rims in well-ſheltered borders cloſe to a ſouth wall. The pots containing hardy plants ſhould likewiſe be plunged in the earth in ſome dry ſituation up to the rims, to protect the roots from froſt.

49 Bulbous roots in beds.

During ſevere froſty weather the beds in which the finer ſorts of hyacinths, tulips, ranunculuſes, anemones, &c. have been planted, ſhould be protected by a covering of mats or ſtraw; but if the plants have begun to make their appearance above ground, the beds ſhould be arched over with low hoops and covered with mats, which ought to be fixed down to prevent their being blown off by the wind; and they ſhould be removed occaſionally during mild weather.

50 Plant bulbous roots.

If any hyacinth, tulip, narciſſus, crown imperial, crocus, or ſnowdrop roots remain unplanted, they ought now to be put into the ground. For the method of planting them, ſee OCTOBER.

51 Sow hardy annuals.

About the latter end of the month, if the weather is mild, ſow a few ſweet peas in any warm ſheltered ſituation for flowering early, alſo ſome ſeeds of candytuft, larkſpur, adonis, dwarf ſunflower, perſicaria, venus navel-wort, venus looking-glaſs, lobel's-catchfly, and panſy violet.

52 Force flowers in the hot-houſe.

Pots of pinks, carnations, roſes, Perſian or common lilach, hyacinth, polyanthus, narciſſus, Italian narciſſus, dwarf tulip, jonquil, lily of the valley, &c. may be placed in the hot-houſe, where they will flower early. As ſoon as they come into blow they ſhould be removed into a green-houſe, or the apartments of a dwelling-houſe, where they will continue longer in flower than they would do if left in the ſtove, where the great heat would accelerate their decay. All thoſe ſhould have been put into pots the preceding autumn, or at leaſt ſome time previous to their being introduced into the hot-houſe. The roſes in particular require to be well rooted in the pots before they are forced.

January. Nurſery.

53 Management of ſhrubs.

Shrubs may now be pruned, which ſhould be performed with a knife and not with garden ſheers. All irregular ſhoots which extend far beyond the reſt of the branches ſhould be cut off. A few branches ſhould alſo be cut out wherever they are too much crowded together, likewiſe all dead and decayed ones. After the pruning has been finiſhed, the ground in the ſhrubbery ought to be dug over, and all ſuckers removed. Where the ſhrubs are too much crowded together, ſome of them ought to be taken out; and where any of them have died, or if they ſtand too diſtant, ſome young ones may now be planted to fill up the vacancies.

54 Of graſs walks and lawns.

Graſs walks and lawns ſhould be kept neat by frequent poling and rolling. Poling may be performed in open dry weather, with a long taper aſh pole about twelve or fifteen feet long, which breaks and ſcatters the worm caſts. After this, in moderately dry weather, roll with a wooden roller, to which all the looſe worm-caſts will adhere. Walks or lawns may alſo be made this month during open weather. Good turf may be obtained from commons or downs where ſheep feed, or from fields which have been long under paſture. Each turf ſhould be marked out a yard long and a foot in breadth, and cut to the thickneſs of an inch with a turfing iron. As the cutting proceeds, they ſhould be rolled up compactly with the graſs ſide in. If they are not cloſely rolled up they will be apt to break in carrying. They muſt be laid on the walk or lawn cloſe to one another after the ſurface has been rendered level and compact by proper treading, that it may not ſettle unequally. When they have been put on they muſt be beat down with a wooden rammer, and afterwards rolled with a large iron or wooden roller.

55 Of gravel walks.

Gravel walks ſhould be cleared of weeds and all decayed leaves, and kept clean; and in dry weather they ſhould be occaſionally rolled. New walks may likewiſe be formed now. For the method, ſee MARCH.

56 Edgings.

Edgings of boxwood, thrift, &c. may be planted any time this month in open weather. See OCTOBER.

57 Planting, &c. of hedges.

Hedges of hawthorn, barberry, privet, hazel, holin, yew, birch, elm, elder, &c. may be planted during this month. See NOVEMBER. Old hedges which have become open below ſhould be plaſhed. See DECEMBER.

58 Of foreſt trees.

Foreſt trees for ornamental plantations, coppices, or woods, may be planted either now, or at any time from the fall of the leaf till the riſe of the ſap in ſpring. See OCTOBER.

SECT. IV. *Nurſery.*

59 Management of ſhrubs and trees.

PRUNE and tranſplant ſhrubs, fruit and foreſt trees. Trim the ſtems of foreſt-trees, and cut off all irregular

January. Green-house and hot-house.

regular rambling ſhoots of ſhrubs, and reduce them to a regular neat form. This work may be executed any time this month, even during froſt, when little elſe can be done. All kinds of hardy deciduous ſhrubs, fruit, and foreſt trees, may be tranſplanted during open weather.

Dig ground in open weather, and wheel out dung in froſt.

Vacant compartments of ground may be dug any time during open weather; and likewiſe after the neceſſary pruning has been given to the trees and ſhrubs, the ground between the rows may be dug, and all weeds carefully buried.

60 If ſeedlings.

The young plants of many of the tenderer kinds of trees and ſhrubs, ſuch as cedar of Lebanon, and ſome other ſpecies of pine, cypreſs, chineſe arbor vitæ, ſtrawberry-tree, &c. require to be protected during froſt. If they have been raiſed in boxes or pots, they may be placed in garden frames and occaſionally covered with the glaſſes; but care muſt be taken always to remove the glaſſes in mild open weather. If the plants ſtand in beds in the open ground, they may be covered with mats ſupported on hoops, which muſt be removed during favourable weather, or a covering of peaſe ſtraw, or ſomething of that nature may anſwer the purpoſe.

61 To propagate trees, &c. by layers,

Layers of many kinds of trees and ſhrubs may be made any time this month during open weather; many of them which are laid now will be well rooted and fit for removing by October; for the method, ſee NOVEMBER.

62 By cuttings.

Put in cuttings of honeyſuckles, gooſeberries, currants, &c. indeed moſt kinds of trees and ſhrubs may be propagated by cuttings. For this purpoſe ſelect the ſtraight ſhoots of laſt year's growth; take them off by a clean cut with a ſharp knife, and reduce them to the length of ten, twelve, or fifteen inches, by cutting off part of their ſmaller extremities. Plant them in rows a foot apart, and at the diſtance of four or five inches from one another in the rows, taking care to inſert one-third or one half of their length into the ground. Though cuttings will grow when their ſmaller extremities are put into the ground, they never ſucceed ſo well in this inverted poſition, therefore in planting, attention ſhould be paid to place them in their natural poſition. Older and longer branches of ſome trees and ſhrubs, viz. willow, elder, &c. may be employed as cuttings.

63 By ſuckers.

Gooſeberries, currants, roſes, lilachs, and many other ſhrubs and trees, may be propagated by ſuckers or offſets from the roots: theſe may be taken off any time this month, and planted in rows. Previous to their being planted it would be proper to trim off part of their extremities.

SECT. V. *Green-Houſe and Hot-Houſe.*

64 The air to be cautiouſly admitted.

DURING froſt, keep the glaſſes ſhut; but whenever the weather is mild, give the green-houſe air by opening the glaſſes more or leſs according to the ſtate of the weather: even in the brighteſt mild days during this month the glaſſes ſhould not be opened until about ten o'clock in the morning, and ought to be ſhut again about three in the afternoon. In dull foggy days, even though the weather be mild, they ſhould be opened but little, and that for a ſhort time, and in very damp weather, not at all. When very ſevere froſt prevails, fires muſt be put on, and the flues gently warmed; but the temperature of the air ſhould not be raiſed higher than merely to keep off the effects of the external froſt. A little fire ſhould likewiſe be put on during very wet weather to baniſh the damps. Water ſhould be given to ſuch plants as require it, but ſparingly. Succulent plants, ſuch as aloes, &c. require little or no water at this ſeaſon. All dead and decayed leaves ſhould be carefully picked off, and the green-houſe kept clean.

January. Green-houſe.

65 Pine apple plants require attention.

Particular attention muſt be paid to the pine apple plants which are to produce fruit the enſuing ſummer, as many of them in the courſe of this month begin to ſhew flowers. If due attention be not now paid to keep up a proper heat, both in the tanned bed and in the air of the hot-houſe, the plants may receive ſuch a check as will conſiderably affect the ſize of the future fruit. The bark bed muſt be carefully examined; and if the bark be much decayed and the heat found on the decline, a quantity of freſh tanners bark ſhould be prepared to be added as a refreſhment to the old. The pots containing the pine apple plants ſhould then be taken out of the tan pits, and a quantity of the decayed tan removed from the ſurface and ſides of the pits, to make room for the freſh tan which is to be added. The old tan muſt likewiſe be turned up from the bottom, and well mixed with the new, after which the pots muſt be again plunged into the tan. But if, on examination, the heat of the tan pit be found good, and the tan not much decayed, it will be ſufficient to turn the old tan, and to mix it well together without making any addition of new. This operation will revive the heat of the bed, and preſerve it in good condition for ſome time to come. The heat of the air in the houſe muſt likewiſe be attended to, and regulated by the thermometer and by due attention to the fires. Moderate watering muſt be given once a week or ten days, according as the pine apple plants may ſeem to require it; and care muſt be taken not to pour any of the water into their hearts or among their leaves.

The other plants in the hot-houſe muſt be regularly watered; but thoſe of a ſucculent nature, ſuch as the different ſpecies of aloe, euphorbia, meſembryanthemum, &c. require very little water at a time, and that but ſeldom.

66 Kidney beans.

Kidney beans, ſown in pots or in narrow boxes of about two or three feet long, may be reared in the hot-houſe. Thoſe ſown this month will produce fruit in April or March. When ſown in pots, two or three may be put into each, and covered about an inch deep: When in boxes they may be planted to the depth of an inch along the middle, at the diſtance of two or three inches from one another. The pots or boxes may be placed on the crib of the bark bed, on ſhelves, or any convenient ſituation, within the houſe, where they may not encumber the other plants. After the plants have come up, they ſhould be regularly and frequently watered. The kinds commonly uſed for this purpoſe are the early ſpeckled dwarf, negro dwarf, and dun-coloured dwarf.

67 Cucumbers.

Cucumbers may be raiſed with tolerable ſucceſs in the hot-houſe, which will produce fruit early in ſpring. If the plants have been raiſed in ſmall pots, plunged in the tan of the bark bed, or in hot-beds made of horſe dung, they ſhould be tranſplanted into larger pots or boxes, in which they may remain and produce fruit;

February. Kitchen Garden.

or the ſeeds may be ſown at once in the pots where they are to remain. In this caſe ſix or eight ſeeds may be ſown in each pot, or patches containing that number may be ſown at proper intervals in long narrow boxes. When the plants have come up, only two or three of the ſtrongeſt ſhould be left in each pot or patch. The pots or boxes may be placed in any convenint ſituation in the hot-houſe, but will ſucceed beſt on a ſhelf fixed near the top of the houſe, within a ſhort diſtance of the glaſs. The plants muſt be frequently watered, and have ſome ſmall rods fixed near them, to which the runners may be faſtened.

FEBRUARY.

SECT. I. *Kitchen Garden.*

68 Admit air to cauliflower plants.

THE cauliflower plants, which are under frames, ſhould have plenty of air. Indeed, whenever the weather will permit, the glaſſes ought to be taken off entirely.

About the end of the month, if the weather be mild, ſome of the ſtrongeſt plants may be tranſplanted into the ſituations where they are to remain. They ought to be planted in good well-manured ground, in a warm ſituation, at the diſtance of two feet and a half each way from one another. The ſame attention muſt be paid to cauliflowers under bell or hand-glaſſes. When more than two plants happen to be under one glaſs, the weakeſt of them ſhould be planted out about the end of the month, if the weather be mild, and only one or two ſhould be left under each glaſs: but if the weather is unſettled or ſevere, tranſplanting ought to be deferred till next month.

69 Sow cauliflowers.

Some cauliflower ſeed may be ſown any time this month to produce plants to ſucceed thoſe that have been preſerved during winter under frames or hand-glaſſes, or to ſupply the place of thoſe which may have been cut off by the ſeverity of the weather.

For this purpoſe make a ſlight hot-bed of horſe dung, to the height of 20 inches or two feet; cover it with a light rich earth to the depth of four or five inches, on the ſurface of which ſow the ſeeds, and cover them to the depth of a quarter of an inch with earth of the ſame deſcription. After the ſeed has been ſown, a frame and glaſſes ſhould be put on, if one can be ſpared for this purpoſe; and when the plants begin to appear above ground, they ſhould have plenty of air, whenever the weather will permit, otherwiſe they will be drawn up and become weak. The glaſſes, therefore, (unleſs in very ſevere weather) ſhould be raiſed every day, and in mild ones taken off entirely. When there are no glaſſes to ſpare, the bed may be covered during the night, and in ſevere weather, with mats properly fixed over it. The plants ſhould be ſprinkled with water from time to time, if moderate ſhowers ſhould not render this unneceſſary.

70 Tranſplant cabbages.

Cabbage plants, if tolerably ſtrong, ſhould be tranſplanted in the courſe of this month. See *Planting out cabbages*, JANUARY.

71 Sow cabbages.

About the middle, or towards the end of the month, ſow ſome cabbage and ſavoy ſeed to raiſe plants for late crops in ſummer and autumn. Both the early and late kinds of cabbage may be ſown now, but it is better to ſow them in Auguſt; but if none were ſown in autumn, or if the plants raiſed then have been cut off by the ſeverity of the winter, a quantity of both early and late ſhould be ſown the firſt opportunity this month. That the plants may ſooner acquire ſufficient ſtrength for planting out, it would be proper to ſow them in a ſlight hot-bed. February. Kitchen Garden.

72 Small ſallad.

Where ſmall ſalad is required, let ſome ſeeds of muſtard, creſs, radiſh, rape, &c. be ſown regularly every eight or ten days during the courſe of the month. See JANUARY.

73 Celery.

Earth up celery in open dry weather if the plants have advanced much above ground. Sow ſome upright celery ſeed for an early crop about the middle or towards the end of the month, in a ſmall bed of rich light earth in a warm ſituation. There are three ways in which this may be performed. 1ſt, The earth of the bed ſhould be well broken with the ſpade; the ſeed ſown on the rough ſurface and raked in. 2dly, The ſurface of the bed may be made ſmooth; the ſeed ſown and covered to the depth of a quarter of an inch with light rich earth. 3dly, A quantity of earth, to the depth of about half an inch, ſhould be removed with the back of a rake from the ſurface of the bed into the alleys, which, after the ſeed has been ſown, ſhould be gently replaced with the rake. Thoſe who are very anxious to have early celery, ſhould ſow ſome in a ſlight hot-bed. The plants raiſed now will be fit for uſe in June or July; but it would be adviſeable to ſow few at this ſeaſon, as they will be very apt to pipe or run up to ſeed before they acquire ſufficient ſize: there are two kinds of celery, the Italian, and turnip-rooted or celeriac.

74 Radiſhes.

About the beginning of this month ſow ſome ſhort-topped radiſhes to ſucceed thoſe ſown laſt month, and ſome ſalmon and Italian radiſhes at any time during the month. See JANUARY.

75 Spinach.

Some round-leaved ſpinach may be ſown any time in the courſe of the month, to ſucceed that which was ſown laſt month. See JANUARY.

76 Peas.

Some early peas may be ſown this month. This is likewiſe a proper ſeaſon for ſowing a full crop of late peas, ſuch as marrowfats, rouncivals, Carolina, and ſugar pea, &c. For the diſtances at which they are to be ſown, ſee JANUARY.

77 Beans.

This is the proper time to plant beans. For the method and diſtances, ſee JANUARY.

78 Earth up peas and beans.

Such peas and beans as are ſufficiently advanced in growth ſhould now be earthed up.

79 Sow and tranſplant lettuces.

In mild open weather ſow ſome ſeeds of green and white cos lettuce, likewiſe ſome Sicilian, imperial, brown Dutch, and common cabbage lettuce. See JANUARY.

If young lettuce plants are wanted for tranſplanting early, they ſhould be ſown in a ſlight hot-bed or in ſome warm ſheltered ſituation; and when they have advanced to the height of about two inches, they may be planted out in the open ground. Lettuces that have ſtood the winter in frames, under hand-glaſſes, or in warm borders, ſhould be thinned and left ſtanding at the diſtance of one foot from each other, and thoſe that are drawn out ſhould be planted in ſome proper ſituation.

80 Sow carrot and parſnip.

About the middle or end of this month ſow ſome carrots and parſnips. They ſucceed beſt in light deep ſoil, and in an open ſituation. The ground ſhould be dug, at leaſt one ſpade deep or two, if the depth of the ſoil will

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will admit, and the clods ought to be well broken. They may be ſown either broadcaſt, in narrow beds, or in drills. See MARCH.

81 Beet.

Sow ſome ſeeds of red, white, and green beet, likewiſe of mangel wurzel or German beet. The fine red root of the firſt is uſed as a pickle, &c.; the leaves of the white and green are made uſe of in ſoups, &c.; and the large leaves of the mangel wurzel are boiled and uſed as ſpinach. The footſtalks of its leaves are likewiſe uſed as aſparagus. Each kind ſhould be ſown ſeparately, either broadcaſt or in drills, an inch deep, and about a foot apart; but the mangel wurzel requires more room than the other kinds, becauſe it is of larger growth. After the plants have come up, they ſhould be thinned out, to the diſtance of ſix or eight inches from each other. The ſeed may likewiſe be dibbled in rows, about a foot apart, and at the diſtance of ſix or eight inches from each other in the rows. Two or more ſeeds may be put into each hole; and when the plants appear above ground, one of the ſtrongeſt only ſhould be left.

82 Plant carrots, &c. for ſeed.

Some of laſt year's carrots, parſnips, and beets, ſhould be planted out in rows, two feet apart, and one foot diſtant from each other in the row, to ſtand and produce ſeed.

83 Sow onions and leeks.

Some onions and leeks may be ſown in mild dry weather, any time after the middle of this month. The ground ſhould be well dug, and the ſeeds ſown when the ſurface is dry, and then raked in. The beſt mode is to divide the ground into beds of about four feet wide, for the convenience of thinning, weeding, &c.; but they may alſo be ſown in plots, without being divided into beds, in which caſe, if the ſoil be light, the ſeed may be gently trodden in, before the ſurface is raked. The leeks will be fit for tranſplanting in June and July, and the onions for drawing in Auguſt. Sometimes a ſmall quantity of leek-ſeed is ſown along with the onion; and when the onions are drawn in Auguſt, the leeks are allowed to remain to acquire a proper ſize; but it is better to ſow each ſeparately. The principal kinds of onions are Straſburg, Deptford, Spaniſh, Portugal, long keeping, and red.

84 Hamburgh parſley, &c.

The Hamburgh parſley and ſcorzonera are cultivated for their roots; the ſalſafy for its roots and tops. The roots of all of them, if ſown now or any time in ſpring, will be fit for uſing in autumn, and continue good all winter. The Hamburgh parſley roots are not only uſed for culinary purpoſes, but recommended in medicine. They are ſaid to be uſeful in the gravel. The ſeeds may be ſow in drills, ſix inches apart, and covered with earth to the depth of half an inch. The plants ſhould be thinned in May or June, and left ſtanding at the diſtance of ſix inches from each other in the rows.

85 Sweet-herbs, &c.

About the middle of the month you may ſow ſeeds of burnet, lovage, angelica, marigold, fennel, dill, ſorrel, chervil, and clary. Each kind ſhould be ſown ſeparately, either in the place where they are to remain, or they may be tranſplanted in ſummer. See JUNE.

About the middle or end of the month ſow marjoram, thyme, ſavory, and hyſſop. The plants may either remain where ſown, or be planted out in the beginning of ſummer. See JUNE.

86 Plant garlic, &c.

Towards the end of the month plant ſhalot, garlic, and rokambole. Having procured a quantity of their roots, divide and plant them in rows nine inches apart and ſix inches diſtant from each other in the row. They may be put in to the depth of two inches with the dibble, or placed in drills, two inches deep, drawn with a hoe.

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87 Parſley.

This is a proper time to raiſe a full crop of parſley. See JANUARY.

88 Potatoes.

A few potatoes may be planted about the middle or end of this month for an early crop; but if wanted very early, ſome early dwarf potatoes ſhould be planted in a ſlight hot-bed. For the method of planting, ſee MARCH.

89 Horſe-radiſh.

Horſe radiſh is propagated by offsets or cuttings of the roots, about three inches long, which may be planted either with the dibble or ſpade, at the diſtance of ſix or eight inches from each other, in rows two feet apart. When they are planted with the dibble, the holes ought to be made 10 or 12 inches deep; when with the ſpade a trench ſhould be made a full ſpade deep, in the bottom of which the offsets or cuttings ſhould be placed erect, and covered with earth from the next trench. As they will not appear above ground till the month of May, a crop of ſpinach, radiſhes, or ſmall ſalad, may be got from the ground, and cleared off before the horſe radiſh appears. After the plants have come above ground, they ought to be kept clear of weeds.

90 Sow turnip.

About the middle or towards the end of the month, ſow ſome ſeed of the early Dutch turnip in a border of light earth, in a warm ſituation. See MARCH.

91 Cucumbers and melons.

If no preparations were made laſt month for raiſing early cucumbers and melons, they may be commenced, any time this month, with better proſpect of ſucceſs. For the method of forming and managing the ſeed-bed, ſee JANUARY.—If the cucumbers and melons, ſown laſt month and tranſplanted into ſmall pots, be fit for ridging out, a hot-bed for one or more frames ſhould be got ready for their reception, which ſhould be raiſed to the height of three feet and a half, and covered with a frame and glaſſes. About a week afterwards, if the hot-bed has ſettled unevenly, the frame and glaſſes ſhould be removed; and after the ſurface of the bed has been made perfectly level, replaced. As ſoon as the violent heat has ſubſided, the rank ſteam eſcaped, and all danger of burning apparently over, cover the bed to the depth of two inches with dry light rich earth, and raiſe a conical heap of the ſame earth, to the height of about 10 inches, immediately under the centre of each light. By the following day the earth will have acquired a proper warmth, and the bed will be fit for the reception of the young plants. The earth, laid over the ſurface of the bed, to the depth of two inches, will prevent the rank ſteam of the dung, on the one hand, from riſing up freely, and yet not keep it down altogether: were much of the ſurface of the dung expoſed, and the ſteam allowed to eſcape freely, the young plants would be deſtroyed; and, on the other hand, were it prevented from eſcaping altogether, by laying on earth to a ſufficient depth at once, the bed would become overheated, and the roots of the plants might be burnt.

92 Management of the former crop.

The pots containing the young cucumber and melon plants, which were tranſplanted laſt month (ſee JANUARY), ſhould be well watered the day previous to their being ridged out, to make the ball of earth adhere, and come out of the pot entire. After the tops of the hillocks of earth, which had been raiſed to the height

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height of 10 inches under each light, have been flattened by reducing their height about two inches, make a hole in the centre of each, capable of containing one of the balls of earth, which is to be turned out of the pots. Select ſome pots containing the ſtrongeſt plants; place your hand on the ſurface of the pot, allowing the plants to paſs between your fingers; invert it, and ſtrike the edge of it gently againſt the frame till the ball of earth comes out, which ſhould be put into one of the holes in the hillock juſt mentioned; cloſe the earth round the ball, and make it riſe about an inch over its ſurface. After they have been thus ridged out, they ſhould receive a gentle watering, and be covered with the glaſſes till the ſteam begin to riſe much, when air ſhould be given by raiſing the glaſſes. Theſe hot-beds, into which the cucumbers and melons have been finally tranſplanted, muſt be managed in the ſame manner as the nurſery beds, mentioned laſt month. A covering of ſtraw, or ſomething of that nature, ſhould be laid all round the dung; linings of freſh dung ſhould be applied to the ſides of the bed when the heat begins to decline, air admitted under the ſame circumſtances and with the ſame precautions as there ſtated. If three cucumbers or two melons have been planted in the pots, as before directed, one of the weakeſt of either ſhould be removed immediately before, or after they are ridged out. Should any ſymptoms of burning appear ſoon after the plants have been ridged out, part of the earth, cloſe to the bottom of the hillocks, muſt be removed; and as ſoon as the violent heat has ſubſided, be replaced with freſh earth. When the heat of the bed begins to decline a little, eſpecially if any of the roots of the plants ſhew themſelves through the ſides of the hillocks, a quantity of freſh earth ſhould be applied all round them, which ſhould be kept within the frame for one night previouſly, that it may acquire a proper temperature, for ſhould it be applied cold, it might injure the young roots. Two or three days after this an additional quantity of freſh earth ſhould be applied to the ſides of the hills; and in two or three more the whole ſurface of the bed may be earthed over as high as the tops of the hills.

93 Topping.

When the plants have got two rough leaves, and when the ſecond is about an inch broad, the bud, which is ſituated at the axilla (or baſe) of the ſecond rough leaf, muſt be removed either with the finger, a pair of ſciſſars, or a pen-knife, or, when the bud is very ſmall, with a needle or pin, being careful not to injure the joint. After the plants are thus topped or ſtopped, they ſoon acquire ſtrength; and in about 10 or 12 days, each of them will throw out two or three runners, which will ſhew flowers ſometimes at the ſecond or third joint. Were the plants not to be topped, the principal ſhoots would probably advance to the length of about two feet, without ſending off any runners to fill up the frame, and without ſhewing a ſingle flower. If none of the runners, which are puſhed out after the firſt topping, ſhew flowers at the third or fourth joint, they ſhould be topped likewiſe, which will cauſe each of them to puſh out two or three runners, all of which may perhaps prove fruitful. As theſe runners advance in growth they ought to be trained regularly along the ſurface of the beds, and all very weak or redundant ſhoots removed. The cucumbers, if well managed, will be fit for the table about the end of this or beginning of next month; but the melons will not be ripe before May or June.

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94 Impregnation of the flowers.

Cucumbers and melons have male and female flowers on the ſame plant, which are eaſily diſtinguiſhed from one another. The male flowers, in the centre of which the antheræ are ſituated that contain the farina (or fecundating powder), have ſtalks of an equal thickneſs, without any ſwell immediately under the flowers; whereas a ſwelling is perceptible immediately under the female flowers which contain the female organ of generation, as ſoon as they are puſhed out from the ſtalks of the plant, which is the germen or future fruit. If none of the farina of the male be conveyed into the female flower, the germen decays, becomes yellowiſh, and drops off. It becomes therefore neceſſary, particularly at this early period, to impregnate the female flowers by ſuſpending male flowers over them, and ſhaking ſome of the farina into the piſtillum (or female organ); for after the plants have continued ſome time in flower, the air of the hot-bed in which they grow becomes loaded with the farina, by which means it is wafted into the female flowers. Inſects likewiſe, particularly bees, at a more advanced period of the year, ſerve to convey it from flower to flower. As ſoon as the female flowers have opened, pinch off a newly blown male flower, together with a portion of its foot ſtalk, remove the greateſt part of its corolla or flower leaf, introduce it into the female flower, and either touch the piſtillum of the female gently with the antheræ of the male ſo as to make ſome of the farina adhere, or ſhake the male flower over the piſtillum of the female in order to make ſome of the farina fall on it. In a day or two after impregnation the germen or future fruit begins to ſwell, and in about a fortnight, if the weather be favourable and the heat of the bed good, the young cucumbers may be brought to table. This operation may be employed to produce new varieties, not only of cucumbers and melons, but of many other vegetables. Were the female of one variety of melon to be impregnated with the farina of another, a kind would be produced partaking ſomewhat of the properties of both; thus a large melon, not poſſeſſed of much flavour, might be improved by intermixture with one ſuperior in flavour but inferior in ſize. In hermaphrodite flowers this operation of impregnating, or croſſing, as it is called by cattle breeders, is performed by removing the antheræ from a flower of one ſpecies, and impregnating it with the farina of another of the ſame natural family. The plants proceeding from ſuch a commixture partake more of the properties of the male than the female parent. We have ſeen a hybrid produced from the *papaver ſomniferum* impregnated with the farina of the *papaver orientale*, ſo like the male parent as with difficulty to be diſtinguiſhed from it.

The *papaver orientale* produces only one flower on a ſtalk; ſome of this hybrid however carried more than one, and in this particular alone it reſembled the *papaver ſomniferum*, which branches very much. Mr Knight has made ſome curious and intereſting experiments on this ſubject, which he has detailed in the following letter to Sir Joſeph Banks, publiſhed in the Tranſactions of the Royal Society. "The reſult of ſome experiments which I have amuſed myſelf with making on plants, appearing to me to be intereſting to the naturaliſt, by proving the exiſtence of ſuperfœtation in

95 Mr Knight's obſervations on this ſubject.

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in the vegetable world, and being likely to conduce to ſome improvements in agriculture, I have taken the liberty to communicate them to you. The breeders of animals have very long entertained an opinion that conſiderable advantages are obtained by breeding from males and females not related to each other. Though this opinion has lately been controverted, the number of its oppoſers has gradually diminiſhed, and I can ſpeak from my own obſervation and experience, that animals degenerate in ſize, at leaſt on the ſame paſture, and in other reſpects under the ſame management, when this proceſs of croſſing the breed is neglected. The cloſe analogy between the animal and vegetable world, and the ſexual ſyſtem equally pervading both, induced me to ſuppoſe that ſimilar means might be productive of ſimilar effects in each; and the event has, I think, fully juſtified this opinion. The principal object I had in view, was to obtain new and improved varieties of the apple, to ſupply the place of thoſe which have become diſeaſed and unproductive by having been cultivated beyond the period which nature appears to have aſſigned to their exiſtenee. But as I ſaw that ſeveral years muſt elapſe before the ſucceſs or failure of this proceſs could poſſibly be aſcertained, I wiſhed in the interval to ſee what would be its effects in annual plants. Amongſt theſe none appeared ſo well calculated to anſwer my purpoſe as the common pea, not only becauſe I could obtain many varieties of this plant, of different forms, ſizes, and colours, but alſo becauſe the ſtructure of its bloſſom, by preventing the ingreſs of inſects and adventitious farina, has rendered its varieties remarkably permanent. I had a kind growing in my garden, which, having been long cultivated in the ſame ſoil, had ceaſed to be productive, and did not appear to recover the whole of its former vigour when removed to a ſoil of a ſomewhat different quality: on this my firſt experiment in 1787 was made. Having opened a dozen of its immature bloſſoms, I deſtroyed the male parts, taking great care not to injure the female ones; and a few days, afterwards when the bloſſoms appeared mature, I introduced the farina of a very large and luxuriant gray pea into one half of the bloſſoms, leaving the other half as they were. The pods of each grew equally well, but I ſoon perceived that in theſe into whoſe bloſſoms the farina had not been introduced, the ſeeds remained nearly as they were before the bloſſoms expanded, and in that ſtate they withered. Thoſe in the other pods attained maturity, but were not in any ſenſible degree different from thoſe afforded by other plants of the ſame variety; owing, I imagine, to the external covering of the ſeed (as I have found in other plants) being furniſhed entirely by the female. In the ſucceeding ſpring the difference however became extremely obvious, for the plants from them roſe with exceſſive luxuriance, and the colour of their leaves and ſtems clearly indicated that they had all exchanged their whiteneſs for the colour of the male parent. The ſeeds produced in autumn were dark gray.

"By introducing the farina of another white variety, (or in ſome inſtances by ſimple culture), I found this colour was eaſily diſcharged, and a numerous variety of new kinds produced, many of which were in point of ſize and in every other reſpect much ſuperior to the original white kind, and grew with exceſſive luxuriance, ſome of them attaining the height of more than twelve feet. I had frequent occaſion to obſerve in this plant a ſtronger tendency to produce purple bloſſoms and coloured ſeeds than white ones; for when I introduced the farina of a purple bloſſom into a white one, the whole ſeeds in the ſucceeding year became coloured; but when I endeavoured to diſcharge this colour by reverſing the proceſs, a part only of them afforded plants with white bloſſoms; this part ſometimes occupying one end of the pod, and being at other times irregularly intermixed with theſe which, when ſown, retained their colour. It might perhaps be ſuppoſed that ſomething might depend on the quantity of farina employed; but I never could diſcover, in this or any other experiment in which ſuperfœtation did not take place, that the largeſt or ſmalleſt quantity of farina afforded any difference in the effect produced.

"The diſſimilarity I obſerved in the offſpring afforded by different kinds of farina in theſe experiments, pointed out to me an eaſy method of aſcertaining whether ſuperfœtation, (the exiſtence of which has been admitted amongſt animals), could alſo take place in the vegetable world. For as the offſpring of a white pea is always white, unleſs the farina of a coloured kind be introduced into the bloſſom; and as the colour of the gray one is always transferred to its offſpring though the female be white, it readily occurred to me, that if the farina of both were mingled or applied at the ſame moment, the offſpring of each could be eaſily diſtinguiſhed.

"My firſt experiment was not altogether ſucceſsful, for the offſpring of five pods (the whole which eſcaped the birds) received their colour from the coloured male. There was, however, a ſtrong reſemblance to the other male in the growth and character of more than one of the plants, and the ſeeds of ſeveral in the autumn very cloſely reſembled it in every thing but colour. In this experiment, I uſed the farina of a white pea, which poſſeſſed the remarkable property of ſhrivelling exceſſively when ripe, and in the ſecond year I obtained white ſeeds from the gray ones above mentioned, perfectly ſimilar to it. I am ſtrongly diſpoſed to believe, that the ſeeds were here of common parentage; but I do not conceive myſelf to be in poſſeſſion of facts ſufficient to enable me to ſpeak with deciſion on this queſtion.

"If, however, the female afford the firſt organiſed atom, and the farina act only as a ſtimulus, it appears to me by no means impoſſible, that the exploſion of two veſicles of farina at the ſame moment (taken from different plants) may afford ſeeds (as I have ſuppoſed) of common parentage, and as I am unable to diſcover any ſource of inaccuracy in this experiment, I muſt believe this to have happened.

"Another ſpecies of ſuperfœtation, if I have juſtly applied the term to a proceſs in which one ſeed appears to have been the offſpring of two males), has occurred to me ſo often as to remove all poſſibility of doubt as to its exiſtence. In 1797, that year after I had ſeen the reſult of the laſt-mentioned experiment, having prepared a great many white bloſſoms, I introduced the farina of a white pea, and that of a gray pea, nearly at the ſame moment into each, and as in the laſt year, the character of the coloured male had prevailed, I uſed its farina more ſparingly than that of the white one, and now almoſt every pod afforded plants of different

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ferent colours. The majority however were white, but the characters of the two kinds were not sufficiently distinct to allow me to judge with precision whether any of the seeds produced were of common parentage or not. In the last year I was more fortunate, having prepared blossoms of the little early frame pea, I introduced its own farina, and immediately afterwards, that of a very large and late gray kind; and I sowed the seeds thus obtained in the end of the last summer. Many of them retained the colour and character of the small early pea not in the slightest degree altered, and blossomed before they were 18 inches high, whilst others (taken from the same pods) whose colour was changed, grew to the height of more than four feet, and were killed by the frost before any blossoms appeared.

"It is evident that in those instances, superfœtation took place, and it is equally evident that the seeds were not all of common parentage. Should subsequent experience evince that a single plant may be the offspring of two males, the analogy between animal and vegetable nature may induce some curious conjectures relative to the process of generation in the animal world.

"In the course of the preceeding experiments, I could never observe that the character either of the male or female in this plant at all preponderated in the offspring, but as this point appeared interesting, I made a few trials to ascertain it. And as the foregoing observations had occurred in experiments made principally to obtain new and improved varieties of the pea for garden culture; I chose for a similar purpose the more hardy varieties usually sown in the fields. By introducing the farina of the largest and most luxuriant kinds into the blossoms of the most diminutive, and by reversing this process, I found that the powers of the male and female in their effects on the offspring are exactly equal. The vigour of the growth, the size of the seeds produced, and the season of maturity, were the same, though the one was a very early, and the other a late variety. I had in this experiment a striking instance of the stimulative effects of crossing the breeds; for the smallest variety, whose height rarely exceeded two feet, was increased to six feet, whilst the height of the large and luxuriant kind was very little diminished. By this process, it is evident that any number of new varieties may be obtained; and it is highly probable, that many of these will be found better calculated to correct the defects of different soils and situations, than any we have at present; for I imagine that all we now possess have in a great measure been the produce of accident, and it will rarely happen, in this or any other case, that accident has done all that art will be found able to accomplish.

"The success of my endeavours to produce improved varieties of the pea, induced me to try some experiments on wheat, but those did not succeed to my expectations. I readily obtained as many varieties as I wished, by merely sowing the different kinds together, for the structure of the blossoms of this plant, (unlike that of pea), freely admits the ingress of adventitious farina, and is thence very liable to sport in varieties. Some of these I obtained were excellent, others very bad; and none of them permanent. By separating the best varieties, a most abundant crop was produced, but its quality was not quite equal to the quantity, and all the discarded varieties again made their appearance. It appeared to me an extraordinary circumstance, that in the years 1795 and 1796, when almost the whole crop of corn in this island was blighted, the varieties thus obtained, and these only, escaped in this neighbourhood, though sown in several different soils and situations.

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"My success in the apple (as far as long experience and attention have enabled me to judge from the cultivated appearance of trees which have not yet borne fruit) has been fully equal to my hopes. But as the improvement of this fruit was the first object of my attention, no probable means of improvement either from soil or aspect were neglected. The plants, however, which I obtained from my efforts to unite the good qualities of two kinds of apple seem to possess the greatest health and luxuriance of growth, as well as the most promising appearance in other respects. In some of these, the character of the male appears to prevail; in others, that of the female; and in others both appear blended, or neither is distinguishable. These variations, which were often observable in the seeds taken from the single apple, evidently arise from the want of permanence in the characters of this fruit when raised from seed.

"The results of similar experiments on another fruit, the grape, were nearly the same as of those on the apple, except that by mingling the farina of a black and a white grape, just as the blossoms of the latter were expanding, I sometimes obtained plants from the same berry so dissimilar that I had good reason to believe them the produce of superfœtation. By taking off the cups and destroying the immature male parts (as in the pea), I perfectly succeeded in combining the characters of different varieties of this fruit, as far as the changes of form and autumnal tints in the leaves of the offspring will allow me to judge.

Many experiments of the same kind were tried on other plants; but it is sufficient to say that all tended to evince, that improved varieties of every fruit and esculent plant may be obtained by this process, and that nature intended that a sexual intercourse should take place between neighbouring plants of the same species. The probability of this will, I think, be apparent, when we take a view of the variety of methods which nature has taken to disperse the farina, even of these plants in which it has placed the male and female parts within the same empalement. It is often scattered by an elastic exertion of the filaments which support it in the first opening of the blossom, and its excessive lightness renders it capable of being carried to a great distance by the wind. Its position within the blossom is generally well adapted to place it on the bodies of insects, and the villous coat of the numerous family of bees is not less well calculated to carry it. I have frequently observed with great pleasure the dispersion of the farina of some of the grasses, when the sun had just risen in a dewy morning. It seemed to be impelled from the plant with considerable force, and being blue was easily visible, and very strongly resembled in appearance the explosion of a grain of gunpowder. An examination of the structure of the blossoms of many plants, will immediately point out that nature has something more in view than that its own proper males should fecundate each blossom, for the means it employs are always best calculated to answer the intended purpose.

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poſe. But the farina is often ſo placed that it can never reach the ſummit of the pointal, unleſs by adventitious means; and many trials have convinced me that it has no action on any other part of it. In promoting this ſexual intercourſe between neighbouring plants of the ſame ſpecies, nature appears to me to have an important purpoſe in view; for independent of its ſtimulative power, this intercouſe certainly tends to confine within more narrow limits thoſe variations which accidental richneſs or poverty of ſoil uſually produces. It may be objected by thoſe who admit the exiſtence of vegetable mules, that under this extenſive intercourſe theſe muſt have been more numerous; but my total want of ſucceſs in many endeavours to produce a ſingle mule plant, makes me much diſpoſed to believe that hybrid plants have been miſtaken for mules, and to doubt (with all the deference I feel for the opinions of Linnæus and his illuſtrious followers) whether nature ever did or ever will permit the production of ſuch a monſter. The exiſtence of numerous mules in the animal world between kindred ſpecies is allowed, but nature has here guarded againſt their production, by impelling every animal to ſeek its proper mate; and amongſt the feathered tribe, when from perverſion of appetite, ſexual intercourſe takes place between thoſe of diſtinct genera (A), it has in ſome inſtances at leaſt rendered the death of the female the inevitable conſequence. But in the vegetable world there is not any thing to direct the male to its proper female, its farina is carried by winds and inſects to plants of every different genus and ſpecies, and it therefore appears to me (as vegetable mules certainly are not common) that nature has not permitted them to exiſt at all.

"I cannot diſmiſs this ſubject, without expreſſing my regret, that thoſe who have made the ſcience of botany their ſtudy ſhould have conſidered the improvement of thoſe vegetables, which in their cultivated ſtate afford the largeſt portion of ſubſiſtence to mankind and other animals, as little connected with the object of their purſuit. Hence it has happened, that whilſt much attention has been paid to the improvement of every ſpecies of uſeful animal, the moſt valuable eſculent plants have been almoſt wholly neglected. But when the extent of the benefit which would ariſe to the agriculture of the country, from the poſſeſſion of varieties of plants, which with the ſame extent of ſoil and labour would afford even a ſmall increaſe of produce, is conſidered, this ſubject appears of no inconſiderable importance. The improvement of animals is attended with much expence, and the improved kinds neceſſarily extend themſelves ſlowly; but a ſingle buſhel of improved wheat or peas may in ten years be made to afford ſeed enough to ſupply the whole iſland, and a ſingle apple or other fruit tree may within the ſame time be extended to every garden in it. Theſe conſiderations have been the cauſe of my addreſſing the foregoing obſervations to you at this time; for it was much my wiſh to have aſcertained before I wrote to you, whether in any inſtance a ſingle plant can be the offſpring of two male parents. The deciſion of that queſtion muſt of neceſſity have occupied two years, and muſt therefore be left to the teſt of future experiment."

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The opinion Mr Knight endeavours to eſtabliſh towards the end of his letter, is certainly incorrect, if he means to aſſert that hybrids can only be produced by a commixture of different varieties of the ſame ſpecies, and that none can be produced by the union of plants of different ſpecies. The fact already ſtated relative to the hybrid produced between the *papav. oriental.* and *ſomnif.* (two ſpecies as different, in every reſpect, from each other as the horſe and aſs).

SECT. II. *Fruit Garden.*

96 Pruning of fruit-trees.

WHERE peaches, nectarines, and apricots, have not been pruned before this, that work ought to be done without delay, becauſe the flower buds after they have begun to ſwell (which they do at this ſeaſon) are eaſily rubbed off. Plums, cherries, apples, pears, gooſeberries, currants, and raſpberries, &c. may likewiſe be pruned during this month, if neglected till now.

97 Figs.

About the end of the month you may prune fig trees, as by that time all danger of the young ſhoots being killed by the froſt will be over. As the young ſhoots of laſt ſeaſon alone produce figs the enſuing, a ſufficient ſupply of them muſt be left to nail on to the wall; and ſuperfluous, ill-placed, very ſtrong long-jointed ſhoots, and ſmall weak ones, ought to be cut away cloſe to the branch of the former year's growth. The branches which are retained ought to be laid in and nailed to the wall at full length, at the diſtance of about half a foot from each other. They ought not to be ſhortened, becauſe the figs are generally produced from that part of the branch near to the extremity: on this account likewiſe care muſt be taken, in chooſing thoſe which are to be retained, not only to prefer the ſhoots of moderately vigorous growth, but likewiſe thoſe which have had leaſt of their extremities killed by the froſt, for it frequently happens that the froſt kills the ſucculent extremities of branches, and ſometimes even the whole ſhoot.

Shortening the branches has another bad effect beſides removing the part from which the fruit is to proceed, it makes them throw out a crowd of lateral ſhoots, which create confuſion and ſhade the fruit. All worn-out old branches which are not furniſhed with a ſufficient number of young lateral ſhoots, ought to be cut away, either cloſe to the main branch from which they proceed, or cloſe to ſome ſhoot placed near their lower end. Young fig trees may be planted alſo any time this month. See OCTOBER.

98 Plant, &c. ſtrawberries.

Strawberry beds ſhould now receive a dreſſing. Laſt year's runners ſhould be cut away, weeds and decayed leaves removed, the ground between the rows dug or looſened with the hoe, and ſome earth drawn up about the roots of the plants. Strawberries may be planted towards the end of the month: for the method, ſee JUNE and SEPTEMBER.

99 Force early fruit.

Any time this month you may begin to force the trees on hot walls, in vine, peach, and cherry houſes, &c.

(A) This is ſaid to be the caſe with the drake and the hen.

February. Pleaſure or Flower Garden.

&c. They ought to be covered with the glaſſes, ſome time previous to the application of fire-heat, and if the houſes have been conſtructed with pits for containing hot-beds of tanners bark or horſe dung, a quantity of either ſhould be got ready. If tanners bark is to be uſed, it ought to be ſpread out and expoſed to the air, that it may dry, for if it be put in too wet it will either not heat at all, or heat violently and ſoon rot, but if properly dried, the heat will be moderate and laſt for a long time. When horſe dung is to be uſed, it ought to be forked up into a heap and allowed to remain for a few days, during which time it ſhould be turned two or three times with a fork that it may be thoroughly mixed. Slight fires ſhould be applied for two or three days at firſt, which may be gradually increaſed. They ought to be kindled about ſunſet, and ſupplied with fuel from time to time till about ten o'clock, which will keep the houſe in a proper heat until morning, when the fires ſhould again be ſet a going, if the heat has declined, but it will ſeldom be neceſſary at this ſeaſon to keep the fires burning all day. The fuel employed may be either coal, wood, peat, or turf: of theſe coal is beſt, becauſe it makes the ſtrongeſt, the moſt durable, and moſt eaſily managed fire. The heat of each houſe ſhould be regulated by a thermometer. The degree of warmth kept up at this ſeaſon, ſhould not much exceed the 60° of Fahrenheit. When the ſun ſhines bright, the heat muſt be regulated by opening the glaſſes more or leſs, and admitting the external air. Beſides the trees that may be trained to the wall or front of the houſe, pots or boxes containing cherry or peach trees may be introduced; likewiſe pots of kidney beans, ſtrawberries, &c. roſes, and a variety of other flowers. The trees and plants within the houſe muſt be duly watered, and have plenty of air admitted to them whenever the weather will permit. When the fruit approach to maturity a greater heat ſhould be maintained within the houſe, which may be effected during the day by the rays of the ſun, and ſparing admiſſion of the external air, and during the night (if the weather be cold) by fire.

SECT. III. *The Pleaſure* or *Flower Garden.*

100 Sow tender annuals.

TOWARDS the end of the month, you may ſow ſome tender annuals, ſuch as balſams, cockscombs, globe amaranthus, ice plants, egg plants, &c. They muſt be ſown in a hot-bed, which is to be formed and earthed over in the ſame way as ſeed beds for cucumbers and melons. See JANUARY. The ſeeds may either be ſown in the earth of the bed, or in pots plunged into the earth. Or a few may be ſown in pots, and introduced into a cucumber or melon bed. When the plants have acquired ſufficient ſtrength to admit of being tranſplanted, they ſhould be put into ſeparate pots and tranſferred to other hot-beds. See APRIL.

101 Hardy annuals.

About the end of the month, you may ſow ſome ſeed of mignionet, ten weeks ſtock, larkſpur, flos Adonis, convolvulus, lupines, ſcarlet, ſweet-ſcented, and Tangier pea, candytuft, dwarf lychnis, Venus's looking glaſs, Lobel's catchfly, Venus's navel-wort, dwarf poppy, annual ſunflower, oriental mallow, lavatera, hawkweed, and many others. They muſt be ſown in places where they are to remain, for none of theſe plants ſucceed ſo well when they are tranſplanted. February. Pleaſure or Flower Garden.

Dig ſmall patches with a trowel in the flower borders, break the earth well, remove part of it from the ſurface with the edge of the trowel, and ſow the ſeeds, which ſhould be covered with the earth which had been moved aſide from the ſurface of the patches. The ſmaller ſeeds, ſuch as mignionet, ten weeks ſtock, larkſpur, &c. ſhould be covered to the depth of about a quarter of an inch; the larger ones, ſuch as lupines, painted and ſweet peas, annual ſunflower, &c. may be covered to the depth of an inch. After the plants have advanced a little in growth, they ſhould be thinned out in proportion to their ſize, viz. one ſunflower ſhould be left in a place, two plants of lavatera and oriental mallow, four or five of the larger, and ſix or eight of the ſmaller lupines, and ſo on in proportion.

102 Plant hardy perennials.

Moſt kinds of hardy perennials and biennials may be planted out this month, viz. polyanthuſes, primroſes, London pride, violets, double daiſies, double chamomile, ſaxifrage, roſe campion, rockets, campanula, catchfly, ſcarlet lychnis, double feverfew, bachelor's button, carnations, pinks, ſweetwilliam, columbines, monkſhood, tree primroſe, foxglove, goldenrod, perennial aſters, perennial ſun-flower, holyhocks, French honeyſuckles, wallflowers, and many others.

103 Dreſs and ſow auriculas, &c.

Where auricula plants are much valued, and where there are many of the finer varieties, they are commonly kept in pots. During mild weather any time this month, it would be proper to give them ſome freſh earth. Clear away all dead leaves from the plants, remove ſome of the old earth from the ſides of the pot all around, ſo far as you can do it without injuring the roots, and fill the pots with freſh earth prepared for the purpoſe. See SEPTEMBER.

Auricula and polyanthus ſeed may be ſown any time this month, either in the open grounds or in pots. When ſown in pots or boxes they are more eaſily moved to proper ſituations during different ſeaſons. Sow them in light rich earth, and cover them to the depth of about a quarter of an inch. The pots or boxes ſhould be placed in a ſituation ſheltered from the north, and expoſed to the morning and mid-day ſun, from which they ought to be removed in April to a more ſhady place. They will be fit for tranſplanting in the month of June. See JUNE.

104 Tranſplant carnations.

About the end of the month plant out the carnations which were raiſed laſt year by cuttings or layers, into pots or borders where they are to remain to produce flowers the enſuing ſummer.

105 Evergreens

Any time this month you may tranſplant evergreen trees, and ſhrubs; ſuch as pines, firs, evergreen oaks, hollies, yews, eypreſſes, cedars, phillyreas, arbutuſes, laurels, lauruſtinus, &c.

106 Protect tulips, &c.

The finer ſorts of tulips, hyacinths, anemones, ranunculuſes, &c. ſhould be protected during ſevere weather, as they begin to appear above ground. For the method of ſheltering them, ſee JANUARY.

Graſs walks and lawns ought to be kept clean, poled and rolled at leaſt once a week if the weather permit it. After being rolled with a wooden roller to take off the worm-caſts, a heavy ſtone or iron one ſhould be paſſed over them to render them firm. Their edges ought likewiſe to be cut with an edging iron about the end.

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end of the month, which will give them a neat appearance.

107 Walks and edgings.

Gravel and graſs walks may be made during this month: for the latter, ſee JANUARY, and the former MARCH.

Edgings of boxwood, thrift, daiſies, thyme, hyſſop, &c. may be planted this month. Boxwood forms the neateſt, moſt durable, and moſt eaſily kept edging, and if planted now it will ſucceed very well. For the method, ſee OCTOBER. Where any of the old boxwood edgings have become irregular, they ought to be taken up and replanted.

Thrift is frequently employed as an edging, and well kept makes a very neat one. The plants may be either put in with the dibble ſo cloſe as to toueh, or at the diſtanee of two or three ineches from each other, or planted as boxwood, ſee OCTOBER. Daiſies are ſometimes uſed, and form a very pretty edging; they may be planted in the ſame manner as the thrift.

108 Early flowers forced.

A great variety of flowers, ſuch as hyacinths, jonquils, and roſes, &c. may be placed in the hot-houſe, vinery, or peach-houſe; and when they have come into flower they may be placed in a green-houſe, or in apartments of a dwelling houſe.

SECT. IV. *Nurſery.*

MANY things mentioned under the article work to be done in the *nurſery* for *January* may likewiſe be done this month; ſuch as pruning young trees and ſhrubs, digging between the rows, propagating by cuttings, ſuckers, and layers, &c. See JANUARY.

109 Layers tranſplanted.

Such layers of laſt year, as appear well rooted, ſhould be removed from the parent plant (or ſtool), and planted in rows of from one to two feet aſunder, according to the ſize of the plant, and at the diſtance of a foot or foot and a half from each other in the row.

110 Seeds of trees, &c. ſown,

If ſeeds or ſtones of apples, pears, cherries, and plums, were not ſown laſt autumn to raiſe ſtocks for budding and ingrafting, they ſhould be ſown about the beginning of this month. They ſhould be ſown in light ſoil, and covered to about the depth of an ineh. The plants raiſed from this ſowing will be fit for tranſplanting in the beginning of next winter or ſpring. The ſeeds of berries and nuts of ſhrubs and foreſt trees may likewiſe be ſown any time this month in narrow beds, and covered in proportion to their ſize, viz. the ſmall ſeeds to the depth of about half an inch, the larger to the depth of an inch or an inch and a half, and ſome of the nuts even to a greater depth.

111 Old tranſplanted.

Trees and ſhrubs may be removed from the ſeed-bed or from where they ſtand too thick, and planted out in rows at proper diſtances, or tranſplanted into the places where they are to remain.

112 Stocks budded.

Young trees that were budded ſucceſsfully laſt ſummer ſhould be cut down to within about four inches of the bud. See JUNE and JULY.

113 Fruit trees ingrafted.

Pears, plums, and cherries may be ingrafted towards the end of the month, if the weather is mild: apples likewiſe may be ingrafted at the ſame time, or in the courſe of the following month.

Grafting or engrafting, in gardening, is the taking a ſhoot from one tree, and inſerting it into another, in ſueh a manner, that both may unite cloſely and become one tree.

By the ancient writers on huſbandry and gardening this operation is called *inciſion*, to diſtinguiſh it from inoculation or budding, which they call *inſertion*. Grafting has been practiſed from the moſt remote antiquity, but its origin and invention are differently related by naturaliſts. Theophraſtus tells us, that a bird having ſwallowed a fruit whole, caſt it forth into a cleft or cavity of a rotten tree, where, mixing with ſome of the putrefied parts of the tree, and being waſhed with the rains, it germinated, and produced within this tree a tree of a different kind. This led the huſbandman to certain reflections, from which afterwards aroſe the art of engrafting.

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114 Hiſtory of engrafting.

Pliny gives a different account of the origin of grafting: he ſays, a huſbandman wiſhing to make a palliſade in his ground, that it might endure the longer, and with a view to fill up and ſtrengthen the bottom of the palliſade, wattled it with the twigs of ivy. The effect of this was, that the ſtakes of the palliſades taking root, became engrafted into the twigs, and produced large trees, which ſuggeſted to the huſbandman the art of engrafting.

The uſe of grafting is to propagate any deſirable ſorts of fruit ſo as to be certain of the variety: for as all good varieties of fruit have been accidentally obtained from ſeeds, ſo the ſeeds of theſe, when ſown, will many of them degenerate, and produce ſuch fruit as is not worth cultivating; but when grafts are taken from ſuch trees as produce good fruit, theſe will never alter from their kind, whatever be the ſtock or tree on which they are grafted. Many have ſuppoſed that fruit undergoes a change, by being engrafted; but this is not the caſe, M. Du Hamel tried it on different trees, and for fear of error repeated every experiment ſeveral times. He grafted the peach on the almond, the plum on the apricot, the pear upon the apple, the quince on the white thorn, one ſpecies of plum on another, and the almond and aprieot on the peach. All theſe ſuceeeded alike; the fruit was never altered; the leaves, the wood, the flowers, were perfectly the ſame with thoſe of the tree from which the grafts were taken.

Some authors have made mention of engrafting trees of diſtinct genera on one another; ſuch as the apple on the oak, the elm, the mapple, and the plum. M. Du Hamel tried a number of theſe experiments, none of which proved ſucceſsful. Engrafting ſeems never to ſueceed but when trees of the ſame natural family are grafted on one another. Some trees are ſuppoſed to live longer, and grow more vigorouſly when engrafted than when growing in a natural ſtate. It is ſaid, that this is the caſe with the peaeh, when engrafted on the plum. But it is commonly alleged, that engrafted trees do not live ſo long as they would have done in their natural ſtate. The reaſon why engrafted trees are ſhort lived, perhaps proceeds from another cauſe than merely from the circumſtance of being grafted, viz. the age of the tree from which the ſcions were originally taken.

115 Method of performing it.

The proper tools and other materials uſed in grafting, are, 1. A ſtrong knife for cutting off the heads of the ſtocks previous to the inſertion of the graft; alſo a ſmall hand ſaw for occaſional uſe in cutting off the heads of large ſtocks. 2. A common grafting knife or ſharp pen knife for cutting and ſhaping the grafts ready for inſertion; alſo to ſlope and form the ſtocks for

February. Nurſery. the reception of the grafts. 3. A flat grafting chiſel and ſmall mallet for cleaving large ſtocks, in cleft grafting, for the reception of the graft. 4. A quantity of new baſs ſtrings for bandages for tying the grafted parts cloſe together, to ſecure the grafts, and promote their ſpeedy union with the ſtock. And, 5. A quantity of grafting clay for claying cloſely round the grafts after their inſertion and binding, to defend the parts from being dried by the ſun and winds, for theſe parts ought to be cloſely ſurrounded with a coat of clay in ſuch a manner as effectually to guard them from all weathers, which would prove injurious to the young grafts, and prevent their junction with the ſtock.

For this purpoſe ſome argillaceous loam or pure clay muſt be procured, to which ſhould be added one-fourth part of freſh horſe dung and a ſmall portion of cut hay. The whole muſt be well moiſtened with water, and thoroughly beat with a ſtick after the manner of mortar.

The ſcions or grafts (which ſhould be ſhoots of laſt year) ought to be ſelected and cut off ſome time about the beginning or middle of the month. Each kind ought to be put up ſeparately in little bundles, which ſhould be inſerted into the earth of a dry border, and ſhould be protected during ſevere weather by a covering of ſtraw or ſomething of that nature. The reaſon for taking them off at the time mentioned, is that their growth may be checked, and that they may be preſerved in a condition for grafting; for were they to remain on the trees, their buds would begin to ſwell, and would ſoon advance ſo far as to be unfit for uſing with any proſpect of ſucceſs. The ſtocks intended to be grafted, muſt, previous to the inſertion of the graft, be cut down; thoſe intended for dwarf trees, to be trained on walls or eſpaliers, muſt be cut over five or ſix inches above the ground; thoſe intended for ſtandards ſhould be cut over at the height of five or ſix feet.

The ſtocks muſt vary according to the kinds of fruit to be grafted on them, and to the ſize of the tree to be produced. Apples are grafted on apple ſtocks raiſed from ſeed, cuttings, or layers; for dwarfs, paradiſe pippin or Siberian crab ſtocks are uſed; for half dwarfs, codlin ſtocks raiſed from ſuckers, cuttings or layers; and for full ſtandards, ſtocks raiſed by ſowing the ſeed of crabs or any common apple. Pears are engrafted upon pear ſtocks obtained from ſeed or ſuckers, on quinces, and on white thorn. When they are engrafted on quince ſtocks, they become dwarf, and are fit for eſpaliers, &c.

Cherries are engrafted upon cherry ſtocks obtained by ſowing the ſtones of red or black cherries, and plums are engrafted upon plum ſtocks raiſed from ſeed or ſuckers (B).

There are different methods of grafting, termed whip-grafting, cleft-grafting, crown-grafting, cheek-grafting, ſide-grafting, root-grafting, and grafting by approach or inarching; but whip-grafting and cleft-grafting are the moſt commonly uſed, and whip-grafting moſt of all.

Whip-grafting being the moſt expeditious and ſucceſsful method of grafting, is the moſt commonly practiſed in all the nurſeries; it is always performed upon ſmall ſtocks, from about the ſize of a gooſe-quill to half an inch or a little more or leſs in diameter, but the nearer the ſtock and graft approach in ſize, the better; and is called whip-grafting, becauſe the grafts and ſtock being nearly of a ſize, are ſloped on one ſide ſo as to fit each other, and tied together in the manner of whips or joints of angling rods, &c.; and the method is as follows. Having the ſcions or grafts, knife, bandages, and clay ready, begin the work by cutting off the head of the ſtock at ſome ſmooth part; this done, cut one ſide ſloping upwards, about an inch and a half or near two inches in length, and making a notch or ſmall ſlit near the upper part of the ſlope downwards, about half an inch long, to receive the tongue of the ſcion; then prepare the ſcion, cutting it to five or ſix inches in length, forming the lower end alſo in a ſloping manner, ſo as exactly to fit the ſloped part of the ſtock, as if cut from the ſame place, that the bark of both may join evenly in every part, and make a ſlit ſo as to form a tongue to fit the ſlit made in the ſlope of the ſtock; then place the graft, inſerting the tongue of it into the ſlit of the ſtock, applying the parts as evenly and cloſe as poſſible, and immediately tie the parts cloſe together with a ſtring of baſs, paſſing cloſely ſeveral times round the ſtock and graft; then clay the whole over near an inch thick all round, from about half an inch or more below the bottom of the graft, to an inch above the top of the ſtock, finiſhing the whole coat of clay in a kind of oval form, cloſing it effectually about the ſcion, ſo that neither air nor water may penetrate. The clay muſt be examined from time to time, for ſhould it crack much, or fall off, a quantity of freſh clay ought to be applied immediately. This ſort of grafting may alſo be performed upon the young ſhoots of any bearing tree, if you wiſh to alter the kind of fruit or to have more kinds than one on the ſame tree. By the middle or latter end of May the graft will be well united with the ſtock, as will be evident from the ſhooting of the buds of the graft, when the clay ſhould be removed; but the baſs bandage ſhould remain until the united parts ſeem to ſwell, and be too much confined, then the bandage ſhould be taken off entirely.

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117 Cleft-grafting.

Cleft-grafting is ſo called becauſe the ſtock being too large for whip-grafting, is cleft or ſlit down the middle for the reception of the graft, and is performed in ſtocks from one to two inches diameter or upwards. Firſt, with a ſtrong knife take off the head of the ſtock with a ſloping cut about an inch and a half long, then cleave the ſtock with a ſtrong knife or chiſel and mallet acroſs the ſlope to the depth of about two inches, or long enough to admit the graft, leaving the inſtrument in to keep the cleft open. Prepare the ſcion by cutting it to ſuch length as to leave four or five eyes, ſloping the lower part of it on each ſide, wedge faſhion, to the length of an inch and a half or two inches, making one edge very thin, and leaving the other much thicker with the bark on; then place it in the cleft at the back part

(B) Stocks which are raiſed from ſeed, generally grow more freely and vigorouſly than thoſe raiſed from cuttings or layers, and on that account are called free ſtocks.

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part of the ſtock, with the thickeſt edge outwards to the whole depth of the ſlope, taking care that the bark of the ſtock and graft join exactly; when the knife or chiſel is removed, each ſide of the cleft will preſs on the graft and hold it faſt. It muſt then be bound with a baſs bandage and clayed over as in whip-grafting, leaving three or four of the eyes of the ſcion uncovered.

If large ſtocks or branches are to be grafted in this way, they muſt be cut horizontally and ſmoothed, and may be cleft quite acroſs, and a graft inſerted on each ſide. More clefts indeed than one may be made, and two grafts put in each. This method of grafting may be performed on the branches or ſtems of old trees, with a view to produce vigorous branches or change the kind of fruit.

Towards the latter end of May or beginning of June the junction of the graft with the ſtock will be effectually formed, when the clay may be removed, and in a fortnight afterwards the baſs bandage may alſo be taken away.

118 Crown-grafting.

Crown-grafting is commonly practiſed upon ſuch ſtocks as are too large to cleave, and is often performed upon the large branches of apple and pear trees, &c. that already bear fruit, when it is intended to change the ſorts, or ſupply the tree with a number of new vigorous branches. It is termed crown-grafting, becauſe, after the ſtock or branch has been cut over, ſeveral grafts are inſerted all around betwixt the wood and bark, ſo as to produce a crown-like appearance; this kind of grafting ſhould not be performed until March or early in April, for then the ſap being in motion renders the bark and wood of the ſtock much eaſier to be ſeparated for the admiſſion of the graft. The manner of performing this ſort of grafting is as follows: firſt cut off the head of the ſtock horizontally, and pare the top ſmooth; then having the grafts, cut one ſide of each flat, and ſomewhat ſloping, an inch and a half, forming a ſort of ſhoulder at the top of the ſlope to reſt upon the crown of the ſtock; after the bark of the ſtock has been raiſed by means of a wedge, ſo as to admit the ſcion between the bark and the wood, let the ſcion be thruſt down to the ſhoulder with its cut ſide next the wood of the ſtock: in this manner three, four, or more grafts may be inſerted into one ſtock or branch. After the grafts have been inſerted, let them be tied tight, and let the clay be applied ſo as to riſe an inch above the top of the ſtock, taking care to form it ſo as to prevent the admiſſion of water, which would injure the grafts. Crown-grafting may alſo be performed by making ſeveral clefts in the crown of the ſtock, and inſerting the grafts into the clefts. The grafts will be pretty well united with the ſtock by the end of May or beginning of June, when the clay and bandage may be taken away. The trees grafted by this method will ſucceed very well; but for the firſt two or three years the grafts are liable to be blown out of the ſtock by violent winds, to prevent which, long ſticks muſt be tied to the ſtock or branch, to which they may be fixed.

119 Cheek-grafting.

Cheek-grafting is thus executed. Cut the head of the ſtock off horizontally, and pare the top ſmooth: then cut one ſide ſloping an inch and a half or two inches deep, and cut the lower part of the graft ſloping the ſame length, making a ſort of ſhoulder at the top of the ſloped part; it is then to be placed upon the ſloped part of the ſtock, reſting the ſhoulder upon the crown of it; bind it with baſs, and finiſh it with a covering of clay as in whip-grafting.

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120 Side-grafting.

Side-grafting is done by inſerting grafts into the ſides of the branches without cutting them over, and may be practiſed upon trees to fill up any vacancy, or for the purpoſe of variety, to have ſeveral ſorts of apples, pears, plums, &c. upon the ſame tree. It is performed thus. Fix upon ſuch parts of the branches where wood is wanted to furniſh the head or part of the tree; there ſlope off the bark and a little of the wood, and cut the lower end of the grafts to fit the part as near as poſſible; then join them to the branch and tie them with baſs, and clay them over.

121 Root-grafting.

Root-grafting. This is done by whip-grafting ſcions upon pieces of the root of any tree of the ſame genus, and planting the root where it is to remain; it will take root, draw nouriſhment, and feed the graft.

122 Inarching.

Grafting by approach, or inarching, is preferred when the ſtocks deſigned to be grafted, and the tree from which the graft is intended to be taken, either grow ſo near, or can be placed ſo near together, that the branch or graft may be made to approach the ſtock, without ſeparating it from the tree till after its union or junction with the ſtock, ſo that the branch or graft being bent to the ſtock they together form a ſort of arch, whence it is called grafting by approach, or inarching. It is commonly practiſed upon ſuch trees as are with difficulty made to ſucceed by any of the former ways of grafting. When intended to propagate any kind of tree or ſhrub by this method of grafting; if the tree be hardy enough to grow in the open ground, a proper quantity of young plants for ſtocks muſt be ſet round it, and when grown of a proper height, the work of inarching muſt be performed; if the branches of the tree you intend to take grafts from be too high for the ſtocks, in that caſe the ſtocks planted in pots, muſt be placed on a ſlight ſtage or ſome ſupport of that nature, of ſuch a height as to make them reach the branches. Inarching is ſometimes performed with the head of the ſtock cut off, ſometimes it is allowed to remain; when the head of the ſtock is cut off, the work is more eaſily performed, and is generally more ſucceſsful, becauſe the ſtock having no top of its own to ſupport, will tranſmit all the nouriſhment taken up by its roots into the graft; when the ſtocks are properly placed, make the branches approach to them, and mark on the branches the places where they will moſt eaſily join to the ſtock, and in thoſe parts of each branch, pare away the bark and part of the wood two or three inches in length, and in the ſame manner pare the ſtock at the proper place; then make a ſlit upwards in the branch ſo as to form a ſort of tongue, and make a ſlit downwards in the ſtock to admit it; let the parts be then joined, ſloping the tongue of the graft into the ſlit of the ſtock ſo as to make the whole join in an exact manner; then tie them cloſe together with baſs, and afterwards cover the whole with a proper quantity of clay, as before directed in the other methods. After this, let a ſtout ſtake be fixed for the ſupport of each graft, to which the ſtock and graft may be fixed, to prevent their being diſjoined by the wind. If this operation be performed in ſpring, the graft and ſtock will be united in four months, when the branch may be ſeparated from the parent plant; this ſhould be done cautiouſly and with a ſharp knife, leſt the graft ſhould be

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be ſhaken and looſened from the ſtock. If the head of the ſtock were not removed previous to inarching, it ſhould now be cut off cloſe to the inſertion of the graft, and all the old clay and bandages ſhould be taken away and replaced with new, which ſhould be allowed to remain a few weeks longer. If the graft and ſtock do not ſeem perfectly united the firſt autumn after they have been inarched, they ſhould be allowed to ſtand till next autumn: for were the branch to be cut off from the parent plant before a complete union was formed between it and the ſtock, the operation would prove abortive.

123 A new method.

An anonymous author has given, in a treatiſe publiſhed at Hamburgh under the title *Amœnitates Hortenſes Novæ*, a new method of grafting trees, ſo as to have very beautiful pyramids of fruit upon them, which will exceed in flavour, beauty, and quantity, all that can otherwiſe be produced. This he ſays he had long experienced, and gives the following method of doing it. The trees are to be tranſplanted in autumn, and all their branches cut off: early in the following ſummer the young ſhoots are to be pulled off, and the buds are then to be engrafted into them in an inverted poſition. This he ſays, not only adds to the beauty of the pyramids, but alſo makes the branches more fruitful. Theſe are to be cloſely connected to the trunk, and are to be faſtened with the common ligature; they are to be placed circularly round the tree, three buds in each circle, and theſe circles at ſix inches diſtance from each other. The old trees may be grafted in this manner, the ſucceſs having been found very good in thoſe of twenty years ſtanding; but the moſt eligible trees are thoſe which are young, vigorous, and full of juice, and are not above an inch or two thick. When theſe young trees are tranſplanted, they muſt be fenced round with pales to defend them from the violence of the wind. The buds engrafted muſt be ſmall, that the wounds made in the bark to receive them, not being very large, may heal the ſooner; and if the buds do not ſucceed, which will be perceived in a fortnight, there muſt be others put in their place. The wound made to receive theſe buds muſt be a ſtraight cut, parallel to the horizon, and the piece of bark taken out, muſt be downwards that the rain may not get in at the wound. In the autumn of the ſame year this will be a green flouriſhing pyramid, and the next ſummer it will flower, and ripen its fruit in autumn.

124 Extreme branch-grafting.

Mr Fairman, of Kent, gives an account of a method of renewing decayed trees, by what he calls extreme branch-grafting, which has been publiſhed in the Memoirs of the Society of Arts for 1802. It is addreſſed to the Secretary.

"SIR,

"From much converſation with Mr Bucknall, on the idea of improving ſtandard fruit trees, we could not but remark that in apple orchards, even in ſuch as are moſt valuable, ſome were to be ſeen that were ſtinted and barren, which not only occaſioned a loſs in the production, but made a break in the rows, and ſpoiled the beauty and uniformity of the plantation.

"To bring theſe trees into an equal ſtate of bearing, ſize, and appearance, in a ſhort time, is an object of the greateſt importance in the ſyſtem of orcharding, and alſo for the recovery of old barren trees, which are fallen into decay, not ſo much from age as from the ſorts of their fruits being of the worn out, and deemed nearly loſt, varieties. February. Nurſery.

"Having long entertained theſe thoughts, and been by no means inattentive to the accompliſhment of the deſign, I attempted to change their fruits by a new mode of engrafting, and am bold enough to aſſert that I have moſt fortunately ſucceeded in my experiments; working, if I am to be allowed to ſay it, from the errors of other practitioners, as alſo from thoſe of my own habits.

"My name having ſeveral times appeared in the Tranſactions of the Society for the Encouragement of Arts, &c.; and having the honour of being a member of that Society, I thought no pains or expence would be too much for the completion of ſo deſirable an improvement. Under theſe impreſſions, and having many trees of this deſcription, I made an experiment on three of them in March 1798, each being nearly a hundred years old. They were not decayed in their bodies, and but little in their branches. Two of theſe were golden pippins, and the other was a golden rennet: each had likewiſe been paſt a bearing ſtate for ſeveral years. I alſo followed up the practice on many more the ſucceeding ſpring, and that of the laſt year, to the number of forty at leaſt, in my different plantations (c).

"The attempt has gone ſo far beyond my utmoſt expectation, that I beg of you, Sir, to introduce the ſyſtem to the ſociety for their approbation; and I hope it will deſerve the honour of a place in their valuable Tranſactions.

"I directed the proceſs to be conducted as follows: cut out all the ſpray wood, and make the tree a perfect ſkeleton, leaving all the healthy limbs; then clean the branches, and cut the top of each branch off, where it would meaſure from an inch to two inches in diameter. Some of the branches muſt of courſe be taken off, where it is a little larger, and ſome ſmaller, to preſerve a head or canopy of the tree; and it will be neceſſary to take out the branches which croſs others, and obſerve the arms are left to fork off; ſo that no conſiderable opening is to be perceived when you ſtand under the tree, but that they may repreſent a uniform head. I muſt here remark to the practitioner, when he is preparing the tree as I directed, that he ſhould leave the branches ſufficiently long to allow of two or three inches to be taken off by the ſaw, that all the ſplintered parts may be removed.

"The trees being thus prepared, put in one or two grafts at the extremity of each branch; and from this circumſtance I wiſh to have the method called *extreme branch grafting*. A cement, hereafter deſcribed, muſt be uſed inſtead of clay, and the grafts tied with baſs or ſoft ſtring. As there was a conſiderable quantity of moſs on the bodies and branches of the trees, I ordered my gardener to ſcrape it off, which is effectually done when they are wet, by a ſtubbed birch broom. I then ordered

(c) The average expence I calculated at 2s. 6d. each tree.

bruary. urſery. ordered him to bruſh them over with coarſe oil, which invigorated the growth of the tree, acted as a manure to the bark, and made it expand very evidently; the old cracks were ſoon, by this operation, rendered inviſible.

"All wounds ſhould be perfectly cleaned out, and the medication applied, as deſcribed in the Orchardiſt, p. 14. By the beginning of July the bandages were cut, and the ſhoots from the grafts ſhortened, to prevent them from blowing out. I muſt here, too, obſerve, that all the ſhoots, or ſuckers from the tree, muſt enjoy the full liberty of growth till the ſucceeding ſpring, when the greater part muſt be taken out, and few but the grafts ſuffered to remain, except on a branch where the grafts have not taken; in that caſe leave one or two of the ſuckers, which will take a graft the ſecond year, and make good the deficiency. This was the whole of the proceſs (D).

"By obſerving what is here ſtated, it will appear that the tree remains nearly as large when the operation is finiſhed, as it was before the buſineſs began; and this is a moſt eſſential circumſtance, as no part of the former vegetation is loſt, which is in health fit to continue for forming the new tree. It is worthy of notice, that when the vivifying rays of the ſun have cauſed the ſap to flow, theſe grafts, inducing the fluid through the pores to every part of the tree, will occaſion innumerable ſuckers or ſcions to ſtart through the bark, which, together with the grafts, give ſuch energy to vegetation, that, in the courſe of the ſummer, the tree will be actually covered over by a thick foliage, which enforces and quickens the due circulation of ſap. Theſe, when combined, fully compel the roots to work for the general benefit of the tree.

"In theſe experiments, I judged it proper to make choice of grafts from the ſorts of fruits which were the moſt luxuriant in their growth, or any new variety, as deſcribed in the 17th and 18th volumes of the Society's Tranſactions, by which means a greater vigour was excited; and if this obſervation is attended to, the practitioner will clearly perceive, from the firſt year's growth, that the grafts would ſoon ſtarve the ſuckers which ſhoot forth below them, if they were ſuffered to remain. With a view to accompliſh this grand object of improvement, I gave much attention, as I have obſerved before, to the general practice of invigorating old trees; and I happily diſcovered the error of the common mode of engrafting but a ſhort diſtance from the trunk or body. There the circumference of the wounds is as large as to require ſeveral grafts, which cannot firmly unite and claſp over the ſtumps, and conſequently theſe wounds lay a foundation for after decay. If that were not the caſe, yet it ſo reduces the ſize of the tree, that it could not recover its former ſtate in many years, and it is dubious if it ever would; whereas, by the method of extreme grafting, the tree will be larger in three or four years, than before the operation was performed. For all the large branches remaining, the tree has nothing to make but fruit-bearing wood; and from the very beautiful verdure it ſoon acquires, and the ſymmetry of the tree, no argument is neceſſary to enforce the practice. Some of the trees, done in this way, yielded each two buſhels of apples from the third year's wood.

February. Green-houſe and Hot houſe.

Cement for Engrafting.

One pound of pitch,
One pound of roſin,
Half a pound of bees-wax,
A quarter of a pound of hog's lard,
A quarter of a pound of turpentine;

to be boiled up together, but not to be uſed till you can bear your finger in it."

SECT. V. *Green-houſe and Hot-houſe.*

THE ſame care of the green-houſe is required during this month which was recommended in January. If ſevere froſt, or very wet weather prevails, the glaſſes muſt be kept cloſe during the day to exclude the froſt and damp, or ſlight fires may be had recourſe to for this purpoſe.

125 Air to be admitted.

In mild weather the glaſſes muſt be opened during the day to admit air, and water muſt be given to the plants regularly, though ſparingly. Towards the end of the month it will be proper to remove a little of the earth from the ſurface and ſides of the boxes or pots, and to replace it with ſome freſh compoſt. If any of the orange trees, myrtles, or plants of that nature, have irregular heads, they may be cut ſo as to cauſe them to throw out a number of new branches to fill up any vacant places, or form an entirely new head. If they require to be much pruned, or to be cut over altogether, it would be proper to ſhift them at the ſame time, i. e. to remove them from the box or pot in which they have ſtood with the ball of earth about their roots, part of which, together with any matted roots, ſhould be pared off from the ſides and bottom, and replaced in the boxes and pots, with a proper addition of freſh earth. Any of the plants which are to undergo this operation, that are very ſickly, ſhould have almoſt the whole of the earth removed from their roots, and ought, for ſome time after ſhifting, to ſtand in a bark-bed.

126 Pine ſtove.

If the bark-bed in the pine ſtove received no freſh tan or turning laſt month, it ſhould be examined as early as convenient; and if the heat ſhould have at all declined, it ought immediately to be turned or have an addition of freſh tan, as directed laſt month. See JANUARY.

If a lively heat be not kept up in the bark-bed now, when the plants ſhew flower, the ſize of the future fruit will be conſiderably affected. A proper degree of warmth, applied to the roots of the plants, will make them grow vigorouſly and produce large fruit. The heat of the air of the houſe muſt be kept at a proper temperature, by due attention to the fires every night and morning, and even during the day in froſty weather, or when cold winds prevail. The bark-bed, in which the ſucceſſion pine-apple plants grow, ſhould be examined; and if the heat in it begins to decline, it ought

(D) The ſyſtem ſucceeds equally well on pear, as alſo on cherry trees, provided the medication is uſed to prevent the cherry tree from gumming.

March. Kitchen Garden.

ought to be turned or receive an addition of fresh tan. When the sun shines bright, and the weather is moderate, air must be given by opening some of the glasses. Water should be given regularly both to the pine apple and other plants in the hot-house, but much should not be given at a time.

127 Kidney beans to be watered.

The kidney beans that were sown last month should receive water frequently. If none were sown last month, some of the early dwarf kinds may be sown now.

128 Cucumbers sown.

If no cucumbers were sown last month in the hot-house, some may be sown now; or, plants raised in hot-beds may be introduced, and placed in any convenient situation near the glass.

MARCH.

Sect. I. *Kitchen Garden.*

We need not here give a detailed account of the methods of performing many of the things mentioned under this head, in the two preceding months, though most of them might be performed now with better prospect of success, as this is the principal month in the year for

129 Sow full crops.

sowing and planting full crops of the greater part of kitchen-garden vegetables. We shall, therefore, merely enumerate them. Make hot-beds. Sow cucumbers and melons. Transplant and sow cauliflower. Transplant and sow cabbage. Transplant and sow lettuce. Sow spinach, onions, leeks, radishes, carrots, parsnips, beets, beans, peas, turnips, celery, small salad, parsley, salsafy, and Hamburgh parsley. Plant shallot, garlic, scorzonera, and rockambole.

130 Brocoli.

Some seed of the early purple and cauliflower brocoli should be sown, both about the beginning and towards the end of the month, in a bed of rich earth, in an open situation, to raise plants to be fit for the table the following autumn. For the subsequent management, see April, May, June, and July.

131 Sea cabbage.

The seeds of the sea cabbage (*crambe maritima*) may be sown any time this month, in narrow beds of light earth, about four feet wide, for the convenience of weeding. They may either be sown all over the surface of the bed, tolerably thick, when they are to be transplanted, or in drills a foot and a half or two feet apart, where they are to remain. Those plants are perennial, and every year push up thick succulent shoots. They should be covered some time during the course of the winter, with dry earth, to the depth of a few inches, by which the young shoots, as they come up in spring, are blanched and become fit for use. They should be cut as soon as they appear above ground, or very soon after, in the manner of asparagus.

132 Coleworts.

Sow brown and green cole, or bore cole.

Any time in the course of the month, some seeds of brown and green cole (kale) may be sown in an open situation, for when they are shaded they are apt to grow up tall and weak. The plants raised now will be fit for planting out in summer, and may be cut for use any time from autumn to spring.

133 Asparagus.

About the beginning of this month asparagus seed may be sown in narrow beds of good earth in an open situation. The seed may be scattered regularly all over the surface of the bed, raked in, and then receive a slight covering of earth from the alleys, or in drills, about an inch deep, at the distance of six inches from one another. The plants will appear above ground in four or five weeks, when they ought to be kept clear of weeds and watered occasionally during dry weather. The plants raised now will be fit for transplanting next spring into beds, where they are to remain and produce crops, or into plots, to remain for a year or two till they be fit for forcing.

March. Kitchen Garden.

134 Asparagus to be planted and

This a proper season for making plantations of asparagus, for which purpose young plants of one or two years old are commonly used. They succeed best in a deep light soil, and in an exposed situation. The ground should be well manured, dug to the depth of 12 or 15 inches, and divided into beds of the breadth of four feet and a half, in which the asparagus may be planted in rows, 10 or 12 inches apart, and about the same distance from each other in the rows. The usual mode of planting them is to stretch a garden line along the bed, and to form a drill with a spade, to the depth of about six inches, in which the asparagus roots are placed with their crowns or buds uppermost.

A crop of onions may be sown in beds when it is an object to make the most of the ground.

135 dressed.

The surface of asparagus beds should be loosened or turned over with a fork, in the course of this month. The instrument commonly made use of for this purpose, is a fork with three flat blunt prongs. Care must be taken not to dig too deep, lest the tops of the asparagus roots should receive injury. Immediately after the surfaces of the beds have been loosened, they should be raked over; for if the raking were to be deferred for some time till the buds of the asparagus approach the surface of the ground, they might be broken by the teeth of the rake. Asparagus beds still continue to produce good crops for 10 or 12 years, if properly managed. They ought not to be cut till the third or fourth year after they have been planted in rich soils; however, a few of the strongest shoots may be cut even in the second, but it should be done sparingly. When asparagus has advanced to the height of three or four inches above ground, it should be collected for the table; but as the shoots are commonly cut about three inches under the surface of the ground, care must be taken not to injure the rising buds (for several buds rise in succession from the same root), for this reason, it is commonly cut with an instrument made on purpose, called an *asparagus knife*, which should be introduced close by the shoot to the requisite depth, and directed so as to cut it off obliquely.

136 Artichoke dressed, and

Artichoke plants, that were earthed up during winter to protect them from frost, should now be examined; and if their stems appear to push up vigorously, the earth ought to be removed and levelled. The soil should likewise be loosened from the plants, and if many shoots proceed from the same root, they should all be taken away except three of the strongest. The redundant shoots, if carefully detached from the main roots, may be employed to form new plantations; the earth, therefore, should be so far removed as to allow the hand to be introduced to slip them close to their insertion.

137 planted.

Plantations of young artichokes are made towards the end of this or in the course of next month, as soon, indeed, as the offsets (the only way in which this plant is propagated) can be procured. For this purpose choose a plot of good ground, dig in a good quantity of

March. Kitchen Garden.

of rotten dung, and plant the offsets with a dibble after their tops and roots have been trimmed a little (if it appear neceſſary), in rows about four feet and a half aſunder, and at the diſtance of from two to three feet in the rows. A crop of ſpinach, lettuce, radiſhes, &c. may be got from the ground the firſt year, without injuring the artichokes. This plantation will produce heads in September and October, and will continue to produce plentiful crops for ſix or ſeven years. Whenever artichokes are required late in the ſeaſon, young plantations ought to be formed every year, as it is from them alone that heads may be expected late in autumn; for the old plantations generally produce them in June, July, and Auguſt. There are two ſorts, the large globe, and the French or green oval artichoke; the former is commonly preferred, on account of the ſize of the head and the quantity of eatable matter they afford.

138 -herbs pagated.

Slips or cuttings of ſage, rue, roſemary, hyſſop, thyme, and ſavory, may be planted any time this month. They ſhould be planted about ſix inches apart, and to the depth of nearly two-thirds of their length. By next autumn they will be fit for tranſplanting.

139 ſkirr-

Some ſeeds of ſkirrets may be ſown in narrow beds, in an open ſituation, either in drills ſix inches aſunder, or regularly over the ſurface of the bed. After the plants have come above ground, they ſhould be thinned out to the diſtance of about ſix inches from one another, and allowed to remain in the place where ſown. This plant is frequently propagated by offsets taken from old roots, which ſhould be planted at the diſtance of ſix or eight inches from one another.

140 ney ns,

About the end of the month, if the weather be mild and dry, a few early kidney-beans may be ſown in a well ſheltered ſituation, at the foot of a wall, having a ſouth expoſure. See APRIL. But as theſe plants are tender, they are liable to be injured by cold weather, therefore a ſmall quantity only ſhould be ſown now.

141 car- ns.

About the middle or latter end of the month ſome cardoons may be ſown for tranſplanting. For this purpoſe a piece of light ground ſhould be well dug, the ſeed ſown thinly, and raked in evenly; a few weeks after the plants have come up, they ſhould be thinned out to the diſtance of about ſix inches from one another, to allow them room to grow till they are ſtrong enough to be planted out, which will be in June. See JUNE. They may be ſown likewiſe in rows five feet aſunder, and at the diſtance of four feet from each other in the row, and allowed to remain where ſown. They are biennial, grow to the height of three or four feet, and are cultivated for the ſake of the footſtalks of their leaves, which are blanched by being earthed up ſomewhat in the manner of celery, on which account they require a good deal of room.

142 t es,

This is a proper time to plant chives, a ſmall ſpecies of onion, which is uſed in ſpring as a ſubſtitute for young onions. They grow in large tufts, which are propagated by parting the roots into ſmall tufts containing eight or ten bulbs, which may be planted with the dibble in beds or rows at the diſtance of ſix or eight inches from one another.

143 Jeruſalem artichokes,

You may now plant Jeruſalem artichokes, a ſpecies of ſunflower (*helianthus tuberoſus*) the roots of which ſomewhat reſemble the potato, and are to be planted much in the ſame manner, to the depth of about four inches, in rows three feet apart, and about half that diſtance from each other in the row. They are fit for the table in October, and continue good all winter and ſpring.

March. Kitchen Garden.

144 potatoes,

A full crop of potatoes may be planted any time towards the end of this or in the courſe of next month. Cuttings of moderate-ſized potatoes (of the variety intended to be planted), each containing one or two eyes at leaſt, may be put in with a blunt dibble, to the depth of about four inches, in rows two feet apart, and at the diſtance of about a foot from each other in the row, or in trenches or holes made with the ſpade. In the fields they are planted either with the dibble or in furrows made by the plough. See AGRICULTURE. They ſucceed beſt in light ſoil, which ſhould be well manured. After they have come above ground, they ought to be kept clear of weeds, and have a quantity of earth drawn up about their ſtems. There are many varieties of this vegetable, which are obtained from ſeed; the principal are, early dwarf, champion, large round white, oblong red and white kidney, common kidney, ſmall white kidney, round red, large round dark red, &c.

145 and mint,

Any time in the courſe of this month new plantations of mint may be formed. This plant is propagated by parting the roots or by cuttings of the young ſtalks; the former is practiſed this month, the latter in next and following month. Procure a quantity of the roots from an old plantation of mint; part and plant them in rows ſix inches aſunder, and about the ſame diſtance from each other in the row, either with the dibble, or in drills about an inch deep, drawn by the hoe. Theſe plants ſucceed very well in any ſoil, but prefer a moiſt one. The kinds commonly cultivated are ſpearmint, peppermint, orangemint, &c.

146 Sow Indian creſſes,

The leaves and flowers of Indian creſſes are frequently uſed for ſalads, and their ſeeds for pickling. The ſeeds may be ſown about the beginning of the month, at the diſtance of two or three inches from each other, in drills, about an inch deep. If they are not ſown along ſide of a hedge or other ſupport, they may have ſticks placed beſide them like peas after they have come above ground. There are two kinds, the large, and dwarf; the former is generally preferred.

147 baſil, &c.

Seeds of baſil, love apple (or *tomatoes*), and capſicum, may be ſown any time this month. They are tender annuals, and muſt be ſown in a hot-bed, to be afterwards planted out in the open ground in May; they muſt be managed like other tender annuals. See *Flower Garden*. Baſil is uſed in ſoups and ſalads, and muſt be ſown in very dry earth, otherwiſe the ſeeds will rot. Love apples are uſed in ſoups and for pickling. The capſicum, of which there is great variety, is uſed as a pickle, and for ſeaſoning. The principal kinds are the long-podded, heart-ſhaped, bell-ſhaped, angular-podded, round ſhort-podded, cherry-ſhaped, &c.

148 cucumbers and melons.

Sow cucumbers and melons, to be planted out under hand or bell-glaſſes.

Some cucumber and melon ſeed may be ſown towards the end of this month, in any of the beds already employed; or one may be formed on purpoſe to raiſe plants to be reared under bell or hand-glaſſes. Thoſe ſown now will be fit for ridging out in the beginning of May. See MAY.

March. Fruit Garden, &c.

Sect. II. *Fruit Garden.*

149 Trees pruned,

All kinds of fruit trees mentioned under this head laſt month may be pruned now, though it ought to be performed as near the beginning of the month as poſſible; for if the weather has been mild during the preceding month, many of the trees will have advanced too far to be in a ſtate proper for pruning. Figs, however, on account of the late period at which they begin to puſh, may be ſafely pruned; indeed this is the beſt ſeaſon for pruning them.

150 planted,

Fruit trees may ſtill be planted, though the earlier in the month the better; for if mild weather prevails, the buds of the trees will have advanced ſo far before the end of the month, as to render tranſplanting leſs ſafe. For the method, ſee October. The duration of the planting ſeaſon depends more on the mildneſs and ſeverity of the weather than the time of the year.

151 protected in flower,

When apricot, nectarine, and peach trees are in flower, they ſhould be protected during froſt with large garden-mats fixed to the top of the walls by hooks, and faſtened at the bottom to prevent them from being agitated by the wind ſo as to daſh off the bloſſoms. Theſe mats muſt be removed during the mildeſt part of the day, unleſs when the weather is very ſevere, and without ſunſhine. Inſtead of mats, old fiſh-nets doubled may be uſed for this purpoſe, and need not be removed during the day; a number of ſmall branches of evergreens (well clad with leaves) fixed among the branches of the trees in flower, will alſo afford ſhelter to the bloſſom and ſetting fruit.

Dreſs ſtrawberry beds, if not done laſt month. See February.

152 and forced

Fruit trees on hot walls, in peach, cherry, and vine-houſes, muſt be duly attended to, muſt receive air and water regularly, and have the fires put on every evening and cold morning.

Sect. III. *Flower Garden and Pleaſure Ground.*

153 Tranſplant early annuals.

If any early annuals, ſuch as balſams, cockscombs, &c. were ſown laſt month, they will be fit for planting out into ſmall pots or a hot-bed prepared for the purpoſe. This hot-bed ſhould be raiſed to the height of two feet; and when the violent heat has ſubſided, covered over to the depth of ſix inches with rich dry earth. The plants may be put in at the diſtance of three or four inches from one another, or rather in ſmall pots, becauſe from theſe they can be more eaſily removed into larger ones at a ſubſequent period. Due attention muſt be paid to give them water and air when requiſite; and linings of freſh dung muſt be applied to the bed whenever the heat begins to decline. If properly taken care of, they will be fit for final tranſplantation in May or June.

If no tender annuals were ſown in February, ſome may be ſown any time this month.

Sow leſs tender or half-hardy annuals, ſuch as China aſter, Indian pink, capſicum, French and African marigold, chryſanthemum, tree and purple amaranthus, and Chineſe hollyhocks.

154 Sow tender and hardy annuals.

Form a ſlight hot-bed any time this month, which need not be raiſed higher than two feet, and earth it over to the depth of about ſix inches. The ſeed may be ſown in narrow drills, at the diſtance of two or three inches from one another, and each kind, ſeparately or in pots, plunged in the earth of the bed. After the plants have come up, they will require plenty of free air and moderate watering; and when they have acquired the height of two or three inches, they muſt be gradually hardened to bear the open air, by taking the lights entirely off in mild warm days. Inſtead of hot-bed frames and lights, oil-paper frames, or hand-glaſſes, may be made uſe of. The plants raiſed now will be fit for tranſplanting into the flower border in May. If hardy annuals were not ſown laſt month, they may be ſown any time during the preſent.

March. Nurſery.

155 Management of chryſanthemums and auriculas

Cuttings of double chryſanthemums which were planted laſt autumn in pots or boxes, ſhould be planted out into pots or flower borders if mild weather prevails. Auricula plants in pots ſhould be protected from rain and froſt, and ſhould ſtill be kept covered with hooped arches, over which mats may be occaſionally thrown, for ſhould they be expoſed to much rain or ſevere weather now when their flower-ſtalks begin to advance, the future bloom might be injured. Keep the pots clear of weeds, and give them a little water in dry weather, or expoſe them to a gentle ſhower. If the pots received no freſh earth laſt month, let them receive ſome now.

156 hyacinths, &c.

Let the hoops mentioned the two preceding months ſtill continue over the beds of tulips, hyacinths, ranunculus, &c. for if ſevere weather occurs, the beds muſt be protected by a covering of mats, as already mentioned. See January. When the ſtalks of hyacinths, particularly double ones, have advanced almoſt to their full height, they are apt to be borne down by the weight of their own flowers, therefore a neat ſmall ſtick ought to be fixed in the ground cloſe to every plant, to which the flowerſtalks ſhould be faſtened by a piece of baſs or other ſoft ligature.

157 ranunculus, and anemones.

Ranunculuſes and anemones may ſtill be planted; they will ſucceed the early ones, and flower in June and July.

158 Sow biennials, &c.

Towards the end of the month, ſeeds of biennial and perennial flowers may be ſown, ſuch as carnations, pinks, ſweetwilliams, wallflowers, and ſtock julyflowers of all ſorts, alſo roſe campion, catchfly, ſcarlet lychnis, columbines, Greek valerian, polyanthus, auriculas, ſcabiouſes, and Canterbury bells; likewiſe hollyhocks, French honeyſuckles, rockets, honeſty or ſatin flower, tree primroſe, ſhrubby mallow, broad-leaved campanula, foxglove, ſnapdragon or frogſmouth, &c.

Biennial and perennial plants may likewiſe be tranſplanted at this ſeaſon.

159 Plant trees and ſhrubs.

Trees and ſhrubs, both deciduous and evergreen, may ſtill be planted; but that work ſhould be finiſhed before the end of the month.

Sect. IV. *Nurſery.*

160 Ingrafting and treatment of trees budded laſt year.

Fruit trees, elms, &c. may be engrafted; and the ſhoots of trees engrafted laſt year ſhould be ſo ſhortened about the time their buds begin to ſwell, as to leave four or five buds, which will puſh out branches to form a head. The ſhoots of laſt year's growth of trees budded the preceding ſummer ſhould likewiſe be ſhortened, and the heads of trees budded laſt ſummer ſhould be cut off about four inches above the bud, which will cauſe

March. Nurſery.

cauſe it to puſh out vigorouſly. The part of the ſtock which is left will ſerve as a ſupport, to which the young branch may be fixed in the courſe of the ſummer, to prevent it from being blown out by the wind.

161 Sow ſeeds of trees, &c.

Seeds of hardy trees and ſhrubs may be ſown any time this month, in beds three or four feet wide, which ſhould be well dug, and thoroughly pulveriſed. The ſeed may be ſown either regularly over the ſurface of the bed or in drills, and covered in proportion to their ſize; the acorns and other large ſeeds to the depth of from an inch and a half to two inches, and the ſmaller ones from about half an inch to an inch. Some of the more delicate ſhrubs, ſuch as the arbutus, &c. may be ſown in pots or boxes, by which means they will be more eaſily protected from the ſeverity of the weather in winter.

162 Propagate by cuttings.

Moſt kinds of trees and ſhrubs may be propagated by cuttings this month, particularly vines.

The vine cuttings muſt be ſhoots of laſt year's growth, about ten or twelve inches long, and each furniſhed with three buds. If cut from the vines during the winter, before the ſap begins to riſe, and preſerved in dry earth, they will ſucceed the better. Some leave about an inch of the former year's wood attached to each cutting, but this is unneceſſary. They may be planted in rows a foot and a half aſunder, and at the diſtance of eight or ten inches from each other in rows, and ſo deep as to leave only their uppermoſt bud above ground; they ſhould afterwards be occaſionally watered, and kept clear of weeds. Though cuttings of vines may be raiſed in the open air, much better plants may be obtained by ſtriking them in a hot-bed or tan-pit in a hot-houſe. At pruning ſeaſon ſelect ſome well-ripened ſhoots, cut them into pieces of a convenient length, and inſert them a little way into pots filled with dry earth, where they may remain till wanted for planting. Protect them in ſevere, but in mild weather, expoſe them to the free air. About the beginning of this month, if there is no room in the hot-beds already made, prepare one on purpoſe, which may be formed and earthed over exactly like a feed-bed for melons. See JANUARY. Fill a number of pots, about four inches deep, correſponding to the cuttings you mean to plant, with light rich earth. Take the cuttings you have preſerved during the winter; ſelect the roundeſt and fulleſt buds; cut the branch about a quarter of an inch above, and about three inches below the bud, with a ſharp knife, ſo as to make a ſmooth cut, and inſert each cloſe by the ſide of the pot, ſo deep that the bud may be covered about a quarter of an inch by the earth of the pot; for it is alleged, that a cutting ſtrikes with greater freedom when placed cloſe to the ſide than in the middle of the pot. When plants are raiſed in this manner from a ſingle bud, they ſeem as if reared from ſeed. As ſoon as the cuttings are planted, plunge the pots into the earth of the bed, give them a gentle watering, and put on the glaſſes. Attention muſt be paid to the bed, to ſee that the heat be not too ſtrong, for a moderate bottom heat is all that is neceſſary. Air ſhould be freely admitted during the day, and even during the night, in mild weather; but when the weather is cold, the beds ſhould be covered with mats during the night, to protect them from froſt. The cuttings ſhould likewiſe be ſhaded when the ſun ſhines very bright, with mats, and ſhould receive occaſional watering. When the plants are about ſix or eight inches high, they will require to be ſhifted into larger pots, which muſt be done cautiouſly for fear of injuring their roots. Take pots of about ſix inches deep, and about the ſame width; put a little good earth into the bottom of each, and turn the cutting out of the ſmall pot into it with the ball of earth as entire as poſſible, and fill it up with earth. The frames of the beds ſhould be raiſed in proportion as the plants increaſe in height, and the heat of the bed renewed by linings of freſh dung when on the decline. Support the ſhoots when they are about ten or twelve inches high, and pinch off the tendrils and lateral ſhoots as ſoon as they appear. They will be fit for planting out in the end of June or beginning of July.

April. Kitchen Garden.

163 Water ſeedlings.

When dry weather prevails, give gentle waterings to ſeedling trees and ſhrubs, and keep them free from weeds.

SECT. V. *Green-houſe and Hot-houſe.*

164 Air to be freely admitted.

THE plants in the green-houſe ſhould receive air freely, unleſs during wet or froſty weather, and more frequent and plentiful waterings than in the two former months. Dead branches or decayed leaves ſhould be removed, and any of the larger leaved plants that appear foul ſhould have their leaves cleaned with a wet ſponge. Thoſe alſo which require ſhifting or pruning may be managed as directed laſt month. Sow ſeeds and plant cuttings of green-houſe plants; for which purpoſe a hot-bed or tan-pit of a hot-houſe will be neceſſary at this ſeaſon.

165 Treatment of pine apples.

Pine apple plants will require a good deal of warmth, particularly in the tan-pit; as their fruit will now be conſiderably advanced, they muſt therefore be kept in a vigorous ſtate of growth, to ſecure large fruit. If the heat of the tan-bed be not very great, at leaſt one-third of new tan ought to be added. After the tan has been procured, it ought to be ſpread out and dried a little, and then laid up in a heap, in ſome ſhed adjacent to the hot-houſe, till it begin to ferment. The plants ſhould then be taken from the tan-bed, and a quantity of the decayed tan removed from its ſurface and ſides, to make room for the new, which muſt be thoroughly mixed with the old: and as this operation ought to be completed in the courſe of one day, a ſufficient number of hands ſhould be employed to effect it. Both pine apples and other plants in the hot-houſe ſhould be regularly watered, and have freſh air admitted in bright calm days, from about two hours before till two or three after noon.

APRIL.

SECT. I. *Kitchen Garden.*

166 Management of cucumbers and melons.

IF the heat begin to decline in the cucumber and melon beds, they ſhould receive linings as directed in the former months; for theſe plants will not yield fine fruit, or a plentiful crop, if the beds are deſtitute of a proper heat. Air muſt be admitted every day, and a moderate watering given every four or five days, particularly to cucumbers; but melons ſhould receive it ſparingly, eſpecially when their fruits are ſetting, as much water at that time would prove injurious, and make the fruit drop off. Keep the plants clear of all decayed

April. Fruit Garden.

leaves and decayed male flowers. When the ſun ſhines ſo bright as to cauſe the leaves of cucumbers and melons to flag, it will be proper to ſhade them for two or three hours, during its greateſt heat, with a thin mat or a little looſe hay, ſtrewed thinly over the glaſſes.

Make hot-beds on which to ridge out cucumbers or melons under hand glaſſes or oiled paper frames. See MAY.

167 Plant lettuce,

Sow ſome cabbage, Cilicia, imperial, and large admirable cabbage lettuces any time this month; indeed, ſome ought to be ſown about the beginning, middle, and towards the end of the month, to ſecure a regular ſucceſſion. Should the lettuces that were ſown laſt month or in February ſtand too thick, they may be thinned out and tranſplanted at the diſtance of about ten inches from each other, and watered occaſionally till they take root.

168 kidney beans.

Some early kidney beans, viz. the Batterſea, ſpeckled, dun-coloured, and Canterbury dwarfs, may be planted towards the end of the month, in a well-ſheltered ſituation, expoſed to the ſouth, in drills two feet or two feet and a half aſunder, and about two inches from each other in the drills. The tall running kinds ſhould not be planted till next month.

169 Tranſplant cabbages, &c.

Some of the cabbage and ſavoy plants, which were ſown in February and March, ſhould be thinned and tranſplanted, when their leaves are about two inches broad, into beds, to gain ſtrength before their final tranſplantation; and thoſe which have ſtood the winter may be planted out for good.

170 cauliflowers,

Cauliflower plants under bell or hand glaſſes ſhould have ſome earth drawn up about their ſtems, and ſhould be expoſed to the open air during the day in good weather. Thoſe ſown laſt month ſhould be planted out into beds in the open air or into ſlight hot-beds, to forward their growth. Some of the ſtrongeſt of the plants raiſed in the early part of ſpring may be planted out at the end of the month, at the diſtance of two or two feet and a half each way from one another, and ſhould be occaſionally watered till they are well rooted.

171 brocoli.

Young plants of brocoli, which were ſown laſt month, may be planted out at the diſtance of two or three inches from one another, to acquire ſtrength for final tranſplantation; and ſome ſeed of the early purple, late purple, and cauliflower brocoli, may be ſown to raiſe plants for tranſplanting in June. Some plants of laſt year's ſowing, which produced heads this ſpring, ſhould be allowed to remain for ſeed, which will ripen in Auguſt.

SECT. II. *Fruit Garden.*

172 Tranſplant and prune,

IN late ſeaſons, pear, plum, and cherry trees may ſtill be planted, and even apricot, peach, and nectarine; but it ſhould be done as early in the month as poſſible, for if any of theſe have advanced much in growth before they are tranſplanted, they will not puſh freely in the courſe of the ſummer, and will be liable to be injured by drought. Where pruning has been neglected, it may ſtill be done, but the ſooner the better, for many fruit trees will now be in flower.

173 and protect fruit trees.

Fruit trees in flower ſhould ſtill be protected in cold weather. See MARCH. All ill-placed ſhoots ſhould be rubbed off, and the young fruit on apricot trees where ſet too thick ſhould be thinned.

April. Fruit Garden.

Look over the vines trained on walls about the end of the month, and rub off the young ſhoots which proceed from the old wood, unleſs they happen to be ſituated where a ſupply of young wood is wanted; likewiſe where two ſhoots proceed from the ſame eye on branches of laſt year's growth, let the weakeſt be rubbed off. Stakes ſhould be placed beſide the vines in the vineyard, to which they ſhould be tied, and the ground between the rows ſhould be kept perfectly free from weeds.

174 Dreſs vines.

175 Hiſtory of the vine.

The vine was introduced by the Romans into Britain, and appears formerly to have been very common. From the name of vineyard yet adhering to the ruinous ſites of our caſtles and monaſteries, there ſeem to have been few in the country but what had a vineyard. The county of Glouceſter is particularly commended by Malmſbury in the twelfth century, as excelling all the reſt of the kingdom in the number and goodneſs of its vineyards. In the earlier periods of our hiſtory the iſle of Ely was expreſsly denominated the *Iſle of Vines* by the Normans. Vineyards are frequently noticed in the deſcriptive accounts of Doomſday; and thoſe of England are even mentioned by Bede as early as the commencement of the eighth century.

Doomſday book exhibits to us a particular proof that wine was made in England during the period preceding the conqueſt. And after the conqueſt, the biſhop of Ely appears to have received at leaſt three or four tuns annually, as tithes from the produce of the vineyards in his dioceſe, and to have made frequent reſervations in his leaſes of a certain quantity of wine for rent. Dr Thomas, the late dean of Ely, gives the following extracts from the archives of that church.

	£.	s.	d.
Exitus vineti - -	2	15	3¾
Ditto vineæ - - -	10	12	2½
Ten buſhels of grapes from the vineyard	0	7	6
Seven dolia muſti from the vineyard, 12th Edward II. - -	15	1	0
Wine ſold for - -	1	12	0
Verjuice - -	1	7	0
One dolium and one pipe filled with new wine, and ſuppoſed at Ely. For wine out of this vineyard - -	1	2	3
For verjuice from thence. -	0	16	0

No wine but verjuice made, 9th Edward IV.

From theſe extracts it appears that Ely grapes would ſometimes ripen, and the convent made wine of them; and ſometimes not, and then they converted them into verjuice. Maddocks in his hiſtory of the Exchequer. i. 364. ſays that the ſheriffs of Northamptonſhire and Leiceſterſhire, were allowed their account, for the livery of the king's vinedreſſer at Rockingham, and for neceſſaries for the vineyard. A piece of land in London, now forming Eaſt Smithfield and ſome adjoining ſtreets, was withheld from the religious houſe within Aldgate by four ſucceſſive conſtables of the Tower in the reigns of Rufus, Henry, and Stephen, and made by them into a vineyard, to their great emolument. In the old accounts of rectorial and vicarial revenues, and in the old regiſters of eccleſiaſtical ſuits concerning them, the

April. Fruit Garden.

the tithe of wine is an article that frequently occurs in Kent, Surry, and other counties. And the wines of Glouceſterſhire within a century after the conqueſt were little inferior to the French in ſweetneſs. It is alleged that a black grape very ſimilar to the black muſcadine was introduced from Gaul into Britain, about the middle of the third century. To theſe proofs of the antiquity of vineyards in Britain, we ſhall add the following account of the vineyard at Pains-hill, Surry, (the moſt extenſive one at preſent in England), given by the original proprietor, the honourable Charles Hamilton, to Sir Edward Barry, and publiſhed in his Treatiſe on Wines, p. 468.

"The vineyard at Pains-hill is ſituated on the ſouth ſide of a gentle hill, the ſoil a gravelly ſand: it is planted entirely with two kinds of Burgundy grapes, the Auvernat, which is the moſt delicate, but the tendereſt; and the Miller grape, commonly called the black cluſter, which is more hardy. The firſt year I attempted to make red wine in the uſual way, by treading the grapes, then letting them ferment in a vat, till all the huſks and impurities formed a thick cruſt at the top: the boiling ceaſed, and clear wine was drawn off from the bottom. This eſſay did not anſwer; the wine was ſo very harſh and auſtere, that I deſpaired of ever making red wine fit to drink; but through that harſhneſs I perceived a flavour ſomething like that of ſome ſmall French white wines, which made me hope I ſhould ſucceed better with white wine. That experiment ſucceeded far beyond my moſt ſanguine expectation; for the very firſt year I made white wine, it nearly reſembled the flavour of Champagne; and in two or three years more, as the vines grew ſtronger, to my great amazement my wine had a finer flavour than the beſt Champagne I ever taſted. The firſt running was as clear as ſpirits; the ſecond was œil de perdrix; and both of them ſparkled and creamed in the glaſs like Champagne. It would be endleſs to mention how many great judges of wine were deceived by my wine, and thought it ſuperior to any Champagne they ever drank; but ſuch is the prejudice of moſt people againſt any thing of Engliſh growth, I generally found it moſt prudent not to declare where it grew, till after they had paſſed their verdict upon it. The ſureſt proof I can give of its excellence is, that I have ſold it to wine merchants for fifty guineas a hogſhead; and one wine merchant to whom I ſold five hundred pounds worth at one time aſſured me, he ſold ſome of the beſt of it from 7s. 6d. to 10s. 6d. per bottle. After many years experience, the beſt method I found of making and managing it was this: I let the grapes hang till they had got all the maturity the ſeaſon would give them; then they were carefully cut off with ſciſſars, and brought home to the wine barn, in ſmall quantities, to prevent their heating, or preſſing one another; then they were all picked off the ſtalks, and all the mouldy or green ones were diſcarded, before they were put upon the preſs; where they were all preſſed in a few hours after they were gathered: much would run from them, before the preſs ſqueezed them, from their own weight one upon another. This running was as clear as water, and ſweet as ſyrup; and all this of the firſt preſſing, and part of the ſecond continued white; the other preſſings grew reddiſh, and were not mixed with the beſt. As faſt as the wine run from the preſs into a large receiver, it was put into the hogſheads, and cloſely bunged up. In a few hours one would hear the fermentation begin, which would ſoon burſt the caſks, if not guarded againſt, by hooping them ſtrongly with iron, and ſecuring them in ſtrong wooden frames, and the heads with wedges. In the height of fermentation, I have frequently ſeen the wine oozing through the pores of the ſtaves. The hogſheads were left all the depth of winter in the cold barn, to reap the benefit of the froſts. When the fermentation was over, which was eaſily diſcovered by the ceſſation of noiſe and oozing, but to be more certain, by pegging the caſk, when it would be quite clear, then it was racked off into clean hogſheads, and carried to the vaults, before any warmth of weather could raiſe a ſecond fermentation. In March, the hogſheads were examined: if any were not quite fine, they were fined down with common fiſh glue in the uſual manner; thoſe that were fine of themſelves were not fined down, and all were bottled about the end of March; and in about ſix weeks more would be in perfect order for drinking, and would be in their prime for about one year; but the ſecond year the flavour and ſweetneſs would abate, and would gradually decline, till at laſt it loſt all flavour and ſweetneſs; and ſome that I kept ſixteen years became ſo like old hock, that it might paſs for ſuch to one who was not a perfect connoiſſeur. The only art I ever uſed to it, was putting three pounds of white ſugarcandy to ſome of the hogſheads, when the fine was firſt tunned from the preſs, in order to conform to a rage that prevailed, to drink none but very ſweet Champagne. I am convinced much good wine might be made in many parts of the ſouth of England. Many parts are ſouth of Pains-hill; many ſoils may be yet fitter for it; and many ſituations muſt be ſo: for mine was much expoſed to the ſouth-weſt wind (the worſt of all for vines), and the declivity was rather too ſteep; yet with theſe diſadvantages it ſucceeded many years. Indeed the uncertainty of our climate is againſt it, and many fine crops have been ſpoiled by May froſts and wet ſummers; but one good year balances many diſappointments."

April. Fruit Garden.

In a diſſertation on the growth of wine in England by F. X. Viſper, printed at Bath 1786, there is a method of training vines along the ſurface of the ground propoſed, which ſeems well adapted to the northerly climate of Britain, for which the Rev. M. L. Broeg obtained a patent. Mr Viſper acknowledges that he took the firſt hint from the following paſſage, from Lord Chancellor Bacon: "The lowneſs of the fruit boughs makes the fruit greater, and cauſes it to ripen better; for we always ſee in apricots, peaches, and mello-cottens; upon a wall, the largeſt fruit is towards the bottom; and in France, the grapes that make the wine grow upon low vines bound to ſmall ſtakes, while the raiſed vines in arbours make verjuice." He adds "It is reported, that in ſome places vines are ſuffered to grow like herbs, ſpreading upon the ground, and the grapes of theſe vines are very large; it were proper to try whether plants uſually ſuſtained by props, will not bear large leaves and fruit if laid along the ground."

SECT.

April. Flower Garden, or Pleasure Ground, &c.

Sect. III. *The Flower Garden, or Pleasure Ground.*

176 Sow and transplant annuals.

Sow and transplant tender annuals. See February and March. Protect hyacinths, ranunculuses, and anemones, planted in beds, from heavy rain and frost, as directed in January and February; likewise, when they are in flower, from very bright sunshine, from about two hours before till two or three after noon; but in this case the covering should be raised a considerable height, to admit air, and allow them to be viewed.

Plant tuberoses in a hot-bed or hot-house, and give them but little water till they have come above ground.

177 Plant evergreens.

Evergreen shrubs and trees may still be planted, but the earlier in the month the better.

178 Walks dressed.

Grass walks and lawns should be poled, rolled, and mown. Gravel walks may be broken up and turned.

Sect. IV. *Nursery.*

179 Examine newly engrafted trees.

Look over newly engrafted trees, and see if the clay keeps close about the grafts, as it is apt to crack and fall off; when you find it any way defective so as to admit the air and rain to the graft, then remove it and apply fresh clay in its stead. All shoots which rise from the stalk below the graft must be taken off whenever they are produced; for if permitted to remain, they would rob the graft of nourishment, and prevent it shooting freely.

180 Those budded last year.

Trees that were budded last year, will now begin to push out their first shoots. Should they be infested with insects, so as to cause any of their leaves to curl, these should be picked off, and pains taken to destroy the vermin. Shoots that proceed from the stock under the bud must be rubbed off as soon as they appear.

181 And transplant young ones.

The sowing and transplanting of young trees and shrubs from the seed-bed, or where they stand too thick, should be finished early in the month, and if very dry weather prevail, water should be given to seed-beds, cuttings, and lately transplanted trees and shrubs.

Sect. V. *Green-house and Hot-house.*

Air may be admitted, and water given more freely than in the former months, because the plants will begin now to advance in growth; but in general the management must be nearly the same as recommended last month.

182 Requisite heat for pine apples.

A proper degree of warmth, both in the bark bed and in the air of the hot-house, is requisite for fruiting pine apple plants. Water may be more frequently given, and air admitted more freely, because the weather will be milder; and in other respects they must be managed as directed in March. The succession pine apple plants, or such as are to fruit next year should be shifted into larger pots, (viz. 24s.) the size commonly made use of. When the plants are healthy, they should be turned out of the pots with the ball of earth about their roots as entire as possible, and put them into larger ones with an additional quantity of fresh earth; but should the plants be sickly, infested with insects, or appear to have bad roots, the whole of the earth should be shaken off, and the roots trimmed, a few of the under leaves stripped off the stem, and the plants then put into pots filled entirely with fresh earth.

May. Kitchen Garden.

After the plants have been thus shifted, they should have a moderate quantity of water given them frequently, which will promote their growth. The young pine apple plants which were raised from suckers or crowns last season should likewise be shifted into larger pots, if their roots appear to have filled those in which they have stood during the winter: if healthy, they should be turned out of the pots with the ball of earth entire; if otherwise, they must be treated like the succession plants as above.

183 Propagate hot-house plants.

This is a proper season for propagating hot-house plants by cuttings, layers, &c. or for sowing their seeds. Cuttings of green-house plants may likewise be struck in the bark bed of the hot-house, and kept there till fit for transplanting.

MAY.

Sect. I. *Kitchen Garden.*

184 Treatment of melons, &c.

Melons require attention, particularly when their fruit are setting. The heat of the hot-beds must be kept up by proper linings; water must be given moderately, and air admitted regularly. In warm weather when the sun shines bright, the plants should be shaded from its rays for an hour or two about mid day, by a covering of mats or something of that nature. A piece of tile or slate should be placed under each fruit after it is set, to prevent it from coming into contact with the moist earth of the bed, which would injure it, and cause it to drop off. Ridges may be formed for the reception of the melon and cucumber plants, which were sown last or preceding month, to be raised under hand or bell glasses. These ridges should be about four feet wide, and are to be constructed in the same manner as hot-beds. See January. The dung should be raised to the height of two feet and a half, and covered with six or eight inches of rich light earth, and may be made either in trenches about a foot deep or on the surface of the ground. When more than one ridge is to be constructed, they should be placed parallel to one another at the distance of about four feet, which interval should afterwards be filled up with fresh horse dung when the heat in the ridges begins to decline; this will both revive the heat, and when earthed over, will afford room to extend the advancing runners of the plants. As soon as the ridges are earthed over, the hand or bell glasses may be put on along the middle of the bed, at the distance of four feet, when intended for melons, and three feet when for cucumbers; and the following day, or as soon after as the earth under the glasses has become warm, a hole should be made under each, into which two melon or three cucumber plants are to be put with the ball of earth about their roots; the earth should then be well closed about the ball and stem of the plant, a little water given, and the glasses put on. Shade them for a day or two, and give air during the day by raising the glasses. When the plants have filled the glasses, the runners must be trained out from under them, but this should not take place till the end of the month, or some time in June. Oil paper frames are sometimes used for covering the ridges. These frames

May. Fruit Garden.

frames are made of thin ſlips of wood covered with paper, rendered tranſparent and water proof by means of oil. Melons reared in this way will produce plentifully in Auguſt and September, and cucumbers from the middle of June, till the cold weather in autumn ſet in. If no cucumber plants were raiſed in March or April for this purpoſe, ſome ſeeds may be ſown in the ridges. Some may likewiſe be ſown about the end of the month in the open ground, to produce a crop for pickling; but ſhould cold weather prevail at that time, it ſhould be deferred till June. Gourds and pumpkins may be ſown in the open ground in a warm ſituation, or in a hot-bed, to be afterwards tranſplanted.

185 Plant kidney beans.

A full crop of kidney beans may be planted both of the dwarf and tall running ſorts: the former, viz. black ſpeckled, Batterſea and Canterbury white, ſhould be planted in drills about an inch deep, and two feet and a half aſunder, at the diſtance of two or three inches from each other; the latter, viz. the ſcarlet and large Dutch white, ſhould be ſown in drills, about an inch and a half deep, and three feet and a half or four aſunder. Theſe running kinds muſt have tall ſticks, or ſome ſupport of that nature.

186 Capſicum, &c. planted out.

The capſicum and love apples which were raiſed laſt or the preceding month in hot-beds, may be planted out into well ſheltered ſituations expoſed to the ſouth.

187 Sow ſpinach.

Some ſpinach plants, both of the ſmooth and prickly ſeeded, ſhould be allowed to run up for ſeed; and ſome of the different kinds of radiſhes ſhould be tranſplanted for the ſame purpoſe.

188 Weed and thin crops.

The different crops ſhould be kept clear of weeds, and thinned with the hoe. Turnips may be left at the diſtance of ſeven or eight inches from each other; carrots, ſix or eight; parſnips, eight to ten or twelve; onions, four or five; Hamburgh parſley, ſcorzonera, and ſalſafy, ſix or ſeven; and cardoons, five or ſix; that they may acquire ſtrength for final tranſplantation.

189 Plant out cabbages, &c.

Plant out cabbages, ſavoys, cauliflower, brocoli, and bore cole.

SECT. II. *Fruit Garden.*

190 Wall-trees trained.

As wall trees will now have made vigorous ſhoots, a ſufficient quantity of the beſt placed lateral, and all the terminal ones, ſhould be trained to the wall, and all foreright, ill placed, ſuperfluous, and very luxuriant ſhoots, ſhould be removed. None of the young branches ſhould be ſhortened, unleſs where a ſupply of new wood is wanted to fill up ſome vacant ſpace. When the fruit ſtands too thick on wall trees, they ſhould be thinned. When wall trees are infeſted with inſects, means ſhould be made uſe of to deſtroy them; the curled leaves ſhould be picked off with a view to check their propagation: tobacco duſt may be ſometimes employed with advantage; but water ſprinkled plentifully over the branches with an engine conſtructed on purpoſe, is the moſt efficacious remedy.

191 Examine vines.

Let vines both on walls and in vineyards be looked over; and let all ſuperfluous branches, which proceed from the old wood or lateral ſhoots, which are puſhed out by the young branches, be rubbed off; indeed this muſt be done conſtantly during the ſummer.

June. Kitchen Garden.

SECT. III. *The Flower Garden, or Pleaſure Ground.*

192 Tranſplant tender annuals into hot-beds.

TENDER annuals ſhould be tranſplanted into newly formed hot-beds, when they are wiſhed to flower early and in full perfection, particularly balſams and cockſcombs.

193 Treatment of auriculas.

Let the auricula plants in pots, which are paſt flower, be placed in ſome ſituation where they may enjoy ſome free air and the ſun till about ten o'clock in the morning.

194 Sow wallflower, &c.

Some wallflower and ſtock gilliflower ſeed may be ſown about the beginning of the month; cuttings alſo of double wall-flowers and ſtocks may be planted under bell and hand glaſſes, or in a ſhady border.

195 Tranſplant biennials, &c.

Perennial and biennial plants that were ſown laſt March, will be fit for tranſplanting about the end of the month into beds, where they may remain to acquire ſtrength.

SECT. IV. *Nurſery.*

196 Newly grafted trees.

TOWARDS the end of the month, the clay ſhould be removed from newly grafted trees, and the bandages looſened, becauſe they might check the growth of the grafts, which will now ſhoot freely; and all buds under the graft ſhould be carefully removed.

SECT. V. *Green-houſe and Hot-houſe.*

197 Plants to be removed into open air.

ABOUT the end of the month, if the weather ſhould be favourable, the greater part of the plants may be removed from the green-houſe, and placed in ſome well-ſheltered ſituation in the open air. The plants in the hot-houſe ſhould receive water and air freely, particularly in bright weather.

JUNE.

SECT. I. *Kitchen Garden.*

198 Melons, &c.

THE ſame care of cucumbers and melons which was recommended for laſt month, is neceſſary now; the cucumbers ſown in the open ground laſt month ſhould be thinned, when they begin to puſh out their firſt rough leaves, and a few more ſeeds may be ſown for the ſame purpoſe, but the earlier in the month the better. Tranſplant celery for blanching. For this purpoſe, form trenches, about a ſpade deep and three feet apart; lay the earth which comes out of the trenches regularly along each ſide; lay into each trench ſome well rotten dung, and dig it in: put the plants in a row along the middle of the trench at the diſtance of four or five inches from one another. About a month or ſix weeks after they have been planted, when they have acquired the height of ſix or eight inches, a quantity of earth ſhould be laid about their ſtems, to blanch them and prepare them for the table; this ſhould be done during dry weather, and repeated once a fortnight, or according as the plants advance in growth, till they are blanched to the height of a foot or fifteen inches. The earlier ſown celery will be fit for tranſplanting about the beginning of the month; the later ſown, about the end.

About the latter end of the month tranſplant endive for

June. Fruit Garden, &c.

for blanching; which ſhould be planted out in rows, a foot apart, and at the ſame diſtance from one another in the row. Some endive ſeed ſhould be ſown for a principal crop; the green curled is commonly ſown for this purpoſe, becauſe it is leaſt apt to be injured by rain or cold.

199 Endive blanched.

200 Cauliflowers, &c. planted out.

The cauliflower, brocoli, and bore-cole plants which were ſown laſt month, ſhould be planted out at the diſtance of about three inches from one another, into beds where they may remain, to acquire ſtrength to fit them for final tranſplantation in July. Some of the early cauliflower plants, which have formed good heads, ſhould be allowed to ſtand for ſeed, which will ripen in September.

201 Sow turnips.

About the middle of this month is the beſt ſeaſon for ſowing a principal crop of turnips; the different kinds commonly ſown, are the yellow, white Dutch, round white, ſtone-turnip, Swediſh, black Ruſſian, ſmall French round. The large white Norfolk, green topped, and red-topped, are chiefly uſed for field culture.

202 Plant out leeks,

Plant out leeks in rows nine inches aſunder, and about ſix inches from one another in the row; it is an uſual practice to trim off the extremities of their leaves and of their roots before they are planted.

203 and pot-herbs.

Plant out pot-herbs, ſuch as thyme, ſavory, ſweet-marjoram and hyſſop; likewiſe angelica, marygolds, elary, &c. A rainy or dull day ſhould be choſen, and the plants put in at the diſtance of ſix inches from one another; occaſional watering will be neceſſary, till they have taken root. Cuttings or ſlips of ſage, hyſſop, rue, roſemary, lavender, &c. may be planted in a ſhady ſituation, and occaſionally watered.

SECT. II. *Fruit Garden.*

WALL trees, and vines in the vineyard, require the ſame attention this month that was recommended laſt.

204 Strawberry plants prepared.

When plantations of ſtrawberries are wanted, the young plants that are produced at the joints of the runners, that are furniſhed with good roots, ſhould be taken up about the end of this month, and planted in a ſhady border at the diſtance of about ſix inches from one another; by September they will be fit to be planted out at the diſtance of a foot or fifteen inches from each other.

SECT. III. *Flower Garden, or Pleaſure Ground.*

205 Bulbous roots, &c. taken up.

THE roots of hyacinths, jonquils, ranunculuſes, &c. ſhould be taken up after their ſtalks begin to decay, dried and preſerved till planting ſeaſon; the roots of narciſſus, crocus, ſnow-drop, &c. may likewiſe be taken up and ſeparated, and either planted again immediately or kept till autumn.

Take up alſo autumnal flowering bulbs, ſuch as colchicum, autumnal crocuſes and narciſſus, Guernſey and belladona lilies, cyclamens, &c.; take off the offſets, and plant them again immediately, or keep them till next month.

206 Propagate perennial plants.

Perennial plants, ſuch as double ſcarlet lychnis, double rocket, &c. may be propagated by cuttings of their ſtalks; each cutting ſhould conſiſt of three or four joints, two of which, (or more than one half the length of the cutting), ſhould be inſerted into the ground; they may be either planted into a ſhady border, three or four inches apart, or more cloſely together, and covered with bell or hand glaſſes.

July. Kitchen Garden.

Propagate carnations, pinks, and double ſweet-williams, by layers. Select young ſhoots about five or ſix inches long for this purpoſe; ſtrip off the leaves from the lower part of the ſtalks, and trim off the tops of thoſe placed at its extremity; make a ſlanting cut with a ſharp knife on the under part of the ſtalk, which ſhould commence at a joint near the middle of the ſhoot, and extend upwards almoſt half way to the next; make a hole in the earth about an inch or an inch and a half deep, immediately under the ſhoot, for its reception; fix it down with a ſmall hooked ſtick, and cover it with earth, except an inch or two at its extremity. A little water ſhould be given in dry weather, which will make the layers ſtrike root more readily. Pinks and carnations may likewiſe be propagated by cuttings or pipings. Theſe pipings are formed of the extremities of the young ſhoots, taken off immediately under the third joint, which ſhould be inſerted into light earth almoſt to their tops, (the extremities of their leaves being previouſly trimmed off). They ſhould receive a little water to make the earth ſettle cloſely about them, and ſhould be covered with a bell or hand glaſs. The earth is ſometimes rendered quite wet, and reduced to a ſtate reſembling mortar, before the pipings are introduced.

207 Carnations, &c.

About the end of the month hedges ſhould receive their firſt clipping.

SECT. IV. *Nurſery.*

208 Fruit-trees inoculated.

ABOUT the end of the month you may inoculate peaches, nectarines, apricots, and roſes: for the method, ſee July.

If any of the trees that were budded laſt ſummer, or engrafted laſt ſpring, have made very vigorous ſhoots, ſtakes ſhould be fixed into the ground cloſe to the ſtocks, to which both the ſtocks and ſhoots muſt be fixed.

Propagate both deciduous and evergreen ſhrubs by layers, particularly ſuch as do not puſh out roots freely except from the new wood.

SECT. V. *Green-houſe and Hot-houſe.*

209 Exotics propagated.

IF the green-houſe plants were not placed in the open air laſt month, on account of the coldneſs of the weather, they may be ſafely truſted out now. Theſe plants may be propagated this month by cuttings, layers, inarching, &c.

Hot-houſe plants may likewiſe be propagated now, and ſhould receive a plentiful allowance of air and water; pine apple plants which are approaching to maturity ſhould be ſparingly watered, becauſe too much water would injure the flavour of the fruit.

JULY.

SECT. I. *Kitchen Garden.*

210 Cabbages, &c planted out.

PLANT out cabbages, ſavoys, brocoli, bore-cole, endive and celery; for the methods ſee the former months. Sow ſome brocoli ſeed about the beginning of the month. Sow ſome endive ſeed for a winter crop; the green curled endive is the beſt for this purpoſe, but

ſome

July. Fruit Garden, &c.

some white and Batavian may likewise be sown. Some kidney-beans, of the dwarf kind, should be sown for a late crop. Some turnip-rooted or Spanish radish may be sown, and managed exactly like turnip: there are two kinds, the black and the white; both of which are very hardy, and stand the winter well.

211 Late crops of peas.

Some peas and beans may be sown when a late crop is wanted.

As artichokes now advance to maturity, those who prefer one large head to two or three smaller ones, ought to cut off all the lateral heads from the stalks, before they exceed the size of a hen's egg; which will promote the growth of the principal head. It is a common practice to break down the stalks of artichokes near the ground, as soon as their heads have been cut for the table, to make them push more vigorously from the root.

If the stalks of onions, garlick, and shallot, begin to decay, which is sometimes the case about the end of this month, they should be pulled up and dried. See AUGUST.

SECT. II. *Fruit Garden.*

212 Fruit protected.

As fruits advance to maturity, wall trees should be protected from birds by nets; and means should be taken to destroy snails, wasps, and other insects.

SECT. III. *Flower Garden*, or *Pleasure Ground.*

213 Plant out annuals.

SOME tender annuals may be planted out into the flower borders in the open air.

214 And auriculas, &c.

Seedling auriculas and polyanthuses may be planted out, into a border not exposed to the mid-day sun, at the distance of two inches from one another, and watered occasionally.

SECT. IV. *Nursery.*

INOCULATE apricots, peaches, nectarines, plums, and pears; the first four are commonly inoculated on plum stocks, the last on pear or quince stocks. Inoculating or budding, as it is termed, may be performed on many other trees, and shrubs; the method of performing it is as follows.

215 Method of inoculation.

With a budding knife, which resembles a penknife with a flat handle, make a horizontal cut at some smooth part quite through the bark of the stock, from the middle of which make a perpendicular cut downwards, about two inches in length, so as to form a figure resembling the letter T. Take a young shoot of the tree, with which you intend to inoculate, cut off the leaves from its lower extremity, leaving a small part of the footstalk of each; then, about an inch under the lowest bud, make a cross cut in the shoot almost halfway through, with the knife slanting upwards, and with a clean cut, bring it out about half an inch above the bud, detaching part both of the wood and bark containing the bud. Separate the small piece of the wood which was taken off along with the bud, from the bark, which is readily done with your knife, placing the point of it between the bark and wood at one end; then examine the inside of the bark, to see if the internal end of the bud be left; for if there appears a small hole, the eye is gone with the wood, and the bud becomes useless; but if no hole appears, the bud is good, and may be inserted into the stock, by raising the bark with the hand of the budding knife on each side of the perpendicular cut, immediately under the cross cut. If the piece of bark which contains the bud be too long for the incision made in the stock, it should be reduced to a proper length with the knife, and introduced between the bark and wood of the stock, and placed so as to make the bud project through the perpendicular cut. Having fixed the bud, and placed the bark of the stock closely above it, put a bandage of mat, which should be previously steeped in water to increase its tenacity, round the stock, which should extend from a little below to a little above the incision; taking care that none of the folds of the bandage cover the bud.

July. Green-House and Hot-House.

In three weeks or a month after the inoculation has been performed, the buds will have united with the stock, which is discoverable by the bud appearing plump; the bandages should then be removed: were they to remain, they would cramp the buds and injure them. The incisions should be made in the stocks about six inches above ground, when dwarf trees are wanted; and at the height of six feet, when standards are to be inoculated: the buds remain dormant, and require no further attention till next spring; when they begin to push out, the heads of the stalks should be cut off.

216 Seedling pines transplanted.

Seedling pines, where they stand too thick in the seed-bed, may be transplanted; but great care must be taken to water them and shade them from the sun.

SECT. V. *Green House and Hot House.*

217 Thin the fruit of oranges.

GREENHOUSE plants require a plentiful supply of water at this season. If the fruit have set too thick on orange or lemon trees, they should be thinned, otherwise they will not acquire a proper size.

218 Propagate pine apples.

As many of the pines will ripen their fruit in the course of this month, it is a proper time to begin to propagate these plants, which is done by planting the crowns that are produced at the top of the fruit, and the suckers which proceed from the root of the plants, about the time the fruit is ripe, or soon after they are cut.

These suckers or crowns, if properly managed, will produce fruit in two years, and then decay. Each fruit is surmounted by at least one crown, which frequently has a number of offsets at its base; and each plant, after it has produced fruit, throws out from its root one or more suckers before it decays. The crowns, when they are separated from the fruit, must lie five or six days in some dry place, till the part which was attached to the fruit is completely dried, before they are fit for planting. The suckers which proceed from the root of the plant should be taken off, when they have acquired the length of five or six inches, and when their lower extremity has become brown; they must likewise lie in some dry situation for a few days, till the part by which they were connected with the root of the parent plant be thoroughly dried. Put each crown or sucker into a small pot, filled with light rich earth, and plunge them in the bark-bed of a hot-house, or in a hot-bed made on purpose.

219 Method of raising pines in water.

A method of raising pine apples in water is given by William Bastard, Esq. of Devonshire, in the 67th volume

July. Green-houſe and Hot-houſe.

lume of the Philoſophical Tranſactions. His account of this method is as follows:

"In the front part of the houſe, and indeed anywhere in the loweſt parts of it, the pine-apple plants will not thrive well in water. The way in which I treat them is as follows:—I place a ſhelf near the higheſt part of the back wall, ſo that the pine apples may ſtand without abſolutely touching, but as near it as can be; on this ſhelf I place pans full of water, about ſeven or eight inches deep; and in theſe pans I put the pine-apple plants, growing in the ſame pots of earth as they are generally planted in, to be plunged into the bark-bed in the common way; that is, I put the pot of earth, with the pine plant in it, in the pan full of water, and as the water decreaſes I conſtantly fill up the pan. I place either plants in fruit, or young plants, as ſoon as they are well rooted, in theſe pans of water, and find they thrive equally well: the fruit reared this way is always much larger, as well as better flavoured, than when ripened in the bark-bed. I have more than once put only the plants themſelves without any earth, I mean after they had roots, into theſe pans of water, with only water ſufficient to keep the roots always covered, and found them flouriſh beyond expectation. In my houſe the ſhelf I mention is ſupported by irons from the top; and there is an intervening ſpace of about 10 inches between the back wall and the ſhelf. A neighbour of mine has placed a leaden ciſtern upon the top of the back flue, in which, as it is in contact with the flue, the water is always warm when there is fire in the houſe, and finds his fruit excellent and large. My ſhelf does not touch the back flue, but is about a foot above it; and, conſequently, the water is only warmed by the air in the houſe. Both theſe methods do well. The way I account for this ſucceſs is, that the warm air, always aſcending to the part where the ſhelf is placed, as being the higheſt part of the houſe, keeps it much hotter than in any other part. The temperature at that place is, I believe, ſeldom leſs than what is indicated by the 73° of Fahrenheit's thermometer, and when the ſun ſhines it is often above 100°: the water the plants grow in ſeems to enable them to bear the greateſt heat, if ſufficient air be allowed; and I often ſee the roots of plants growing out of the holes in the bottom of the pot of earth, and ſhooting vigorouſly in the water.

"My hot-houſe, the dimenſions of which it may be proper to know, is 60 feet long, and 11 feet wide, the flues included; ſix feet high in the front, and 11 feet at the back of the inſide of the houſe. It is warmed by two fires. A leaden trough or ciſtern on the top of the back flue is preferable to my ſhelf; as in it the pine plants grow much faſter in the winter, the water being always warmed by the flue. Of this I have ſeen great benefits theſe laſt two months in my neighbourhood.

"It is not foreign to this purpoſe to mention, that as a perſon was moving a large pine plant from the hot-bed in my houſe laſt ſummer, which plant was juſt ſhewing fruit, by ſome accident he broke off the plant juſt above the earth in which it grew, and there was no root whatever left to it. By way of experiment, I took the plant, and fixed it upright in a pan of water, without any earth whatever, in the ſhelf; it there ſoon threw out roots, and bore a pine apple that weighed upwards of two pounds."

1. The *bromelia ananas*, of which there are ſix varieties: 1. *Ovatus*, or oval-ſhaped pine apple. 2. *Pyramidalis* (pyramidal), or ſugar-loaf pine. 3. *Glaber*, with ſmooth leaves. 4. *Lucidus*, with ſhining green leaves. 5. *Serotinus*, with a yellowiſh-coloured fleſh. 6. *Viridis*, or green pine apple. Auguſt. Kitchen Garden. 220 Varieties of the pine apple.

The firſt ſort of ananas is the moſt common in Europe; but the ſecond ſort is much preferable to it, the fruit of this being larger and much better flavoured: the juice of this ſort is not ſo aſtringent as that of the firſt; ſo that this fruit may be eaten in greater quantity, with leſs danger. This ſort frequently produces ſuckers immediately under the fruit, whereby it may be increaſed much better than the common ſort; ſo that in a few years it may be the beſt common ſort in Britain.

The third ſort is preſerved for curioſity by way of variety; but the fruit is not worth any thing.

The ſort with very ſmooth green leaves, was raiſed from ſeeds taken out of a rotten fruit, which came from the Weſt Indies to the late Henry Heathcote, Eſq. from whom Mr Miller received one plant, which produced large fruit: this is what the people of America call the *king pine*.

AUGUST.

SECT. I. *Kitchen Garden.*

221 Sow winter crops of ſpinach.

Sow ſome prickly-ſeeded, or triangular-leaved ſpinach, for a winter and ſpring crop; for though the round-ſeeded produces larger and more ſucculent leaves, the prickly-ſeeded is to be preferred now, becauſe it is by much the hardier of the two. After the plants have got their firſt leaves about an inch broad, they ſhould be thinned to the diſtance of four inches from one another, and kept free from weeds.

222 Cabbage.

Sow ſome cabbage ſeed both of the early and late kinds, to produce plants for next year.

223 Onions.

Sow ſome onions, to be uſed when young in winter or ſpring, or to produce a crop of early onions this ſummer. The Straſburg or any other kind may be ſown now, but the Welſh onion is very hardy, and ſtands the winter well; for though their tops ſhould be deſtroyed by the ſeverity of the weather, they will puſh up again from the root in the ſpring: this onion, however, does not produce bulbs.

224 Cauliflower.

Towards the end of the month ſow ſome cauliflower ſeed to produce plants for an early crop next ſummer, which may be protected during the winter, either under hot-bed frames, bell or hand-glaſſes, or in a well-ſheltered border expoſed to the ſouth. Between the 18th and 24th of this month is, perhaps, the beſt time to ſow theſe ſeeds. The London gardeners, who ſow great quantities, are accuſtomed to ſow them on a particular day, viz. the 21ſt of this month. If they be ſown too early, they are apt to button, as the gardeners term it, i. e. run up to ſeed without producing heads of a proper ſize; and if they be ſown too late, the plants do not acquire ſufficient ſtrength, before winter, to enable them to ſupport the ſeverity of the weather.

225 Lettuce.

Sow ſome lettuce ſeed about the middle of the month, both to ſupply the table late in the autumn, or beginning of winter, and to plant out into well-ſheltered borders, or under hot-bed frames, to ſtand during winter.

Plant

August. Fruit Garden.

Plant out brocoli, ſavoys, bore-cole, and celery, for the uſe of winter and ſpring.

The cardoons which were planted in June ſhould have ſome earth laid up to their ſtems, to blanch them and render them fit for the table. That this may be accompliſhed the more eaſily, tie up the leaves of each plant, with a piece of baſs mat or ſmall ſtraw rope, and apply ſome earth cloſe round the ſtem, which earthing muſt be repeated at intervals, till it riſe to the height of two feet.

226 Plant out brocoli, &c.

227 Time of taking up onions.

The principal crops of onions will be fit for taking up in the courſe of this month. Chooſe a dry day for taking them up; take off the ſtalks within two or three inches of the bulb; ſpread them in ſome dry place, expoſed to the ſunſhine, for 10 or 12 days, that they may be thoroughly dried.

Sect. II. *Fruit Garden.*

228 Dreſs the vines, &c.

Look over vines, figs, and other wall trees; remove all foreright and ſuperfluous branches, and nail the others cloſe into the wall, that the rays of the ſun may have free acceſs to the fruit.

Vines in the vineyard likewiſe ſhould be fixed to the ſtakes, and cleared of all ſuperfluous ſhoots.

Sect. III. *Flower Garden*, or *Pleaſure Ground.*

229 Propagate fibrous-rooted perennials.

About the end of the month, you may propagate by ſlips, fibrous-rooted perennial plants, ſuch as double roſe campion, catchfly, double ſcarlet lychnis, double rocket, double ragged robin, bachelors button, gentianella, polyanthuſes, auriculas, double daiſies, &c. As theſe plants frequently grow in tufts, they may be taken up and divided, taking care that every ſlip be provided with ſome roots.

230 Treatment of auriculas,

Auricula plants in pots ſhould receive freſh earth.

231 and carnations.

Auricula and polyanthus ſeed may be ſown any time this month, but will not come up till ſpring.

Layers of carnations, double ſweetwilliams, and pinks, that are properly rooted, may be ſeparated from the parent plant, and planted into borders or pots. Cuttings and pipings of pinks and carnations, may be planted out into beds or borders.

232 Sow bulbous rooted plants.

Towards the end of the month the ſeeds of bulbous-rooted flowers, ſuch as tulips, hyacinths, narciſſus, iris, crocus, fritillaria, crown imperial, lilies, and ſnowdrops; likewiſe, the ſeeds of anemone, ranunculus, and cyclamen, may be ſown in beds or boxes, to obtain new varieties. They muſt be protected during winter from the froſt; and when they appear above ground in ſpring, they muſt be kept clear of weeds.

Plant out ſeedling biennials and perennials

233 Clip hedges.

About the end of this month hedges ſhould receive their ſecond clipping.

Sect. IV. *Nurſery.*

234 Examine the budded trees.

Budding may ſtill be performed about the beginning of the month, and thoſe trees which were budded three weeks or a month ago, ſhould be examined. If the buds remain plump and freſh, there is reaſon to believe that they have ſucceeded; in that caſe the bandages muſt be looſened.

Sect. V. *Green-houſe and Hot-houſe.*

September. Kitchen Garden.

Green-house plants, in the open air, muſt be managed as already directed.

The plants in the hot-houſe muſt receive a plentiful allowance of air and water.

Succeſſion pine-apple plants, that are to produce fruit next year, ſhould be ſhifted into larger pots, viz. twenty-fours or ſixteens, about the beginning of the month. The plants ſhould be turned out of the old pots and placed in the new ones, a quantity of light rich earth being previouſly put into the bottom of each. Each pot ſhould then be filled with ſome of the ſame earth, watered, and plunged into the tan, which, at the ſame time, ſhould be turned over and receive an addition of about one-third of freſh tan.

SEPTEMBER.

Sect. I. *Kitchen Garden.*

235 Plant out lettuce.

Plant ſome brown Dutch, cos, and common cabbage lettuce, in a well-ſheltered ſituation, expoſed to the mid-day ſun, to be covered with hot-bed frames and glaſſes, which ſhould not be put over them till ſome time next month.

236 Cauliflowers.

Plant out from the ſeed-bed the cauliflowers that were ſown laſt month, into well-ſheltered borders, at the diſtance of three or four inches from one another, taking care not to plant them ſo deep as to cover their hearts with earth. Theſe plants may be either planted out again next month under garden frames, bell or hand-glaſſes, to ſtand during the winter, or may remain where planted.

237 Brocoli, &c.

Plant brocoli, ſavoys, bore-cole, celery, and endive.

Earth up celery and cardoons.

Tie up the leaves of endive with a piece of baſs mat, or ſomething of that nature, to blanch them, and prepare them for the table.

238 Preparation of muſhroom beds.

Muſhroom beds may be formed any time this month, as ſpawn will very eaſily be procured during Auguſt, September, or October. The ſpawn has the appearance of a white mould ſhooting out in ſtrings, which, when bruiſed, ſmells like muſhrooms. It may be obtained either from old muſhroom beds, old hot-beds, or dung hills that are principally compoſed of horſe dung, and from paſture fields, indeed in any place where horſe or ſheep's dung has lain for ſome time undiſturbed and not expoſed to much moiſture; and may be preſerved for a conſiderable length of time, in a proper ſtate for uſing. If ſpawn is not otherwiſe to be procured, ſome may be produced by laying a quantity of horſe-dung and rich earth in alternate layers, and covered with ſtraw to exclude the rain and air; for the more theſe are excluded, the ſooner the ſpawn will appear, which commonly happens in about two months after the dung and earth have been laid together. Muſhroom beds ſhould be formed of dung that has been ſpread out for ſome time, without having been fermented, and may be made two or three feet broad, and of any length. A ſtratum of dung about a foot thick, ſhould be laid firſt, which ſhould be covered with rich earth to the depth of about four inches, then ano-

September. Fruit Garden.

ther ſtratum of dung about ten inches thick, which ſhould be covered like the former; a third ſtratum of dung may be laid and covered with earth like the two former. The whole ſhould be made to grow narrower as it advances in height, and formed into a ridge reſembling the roof of a houſe. When the bed is finiſhed it ſhould be covered with ſtraw, to exclude the rain, and to prevent the bed from being dried by the ſun or wind, in which ſituation it ſhould remain eight or ten days, when the bed will be in a proper temperature of warmth to receive the ſpawn. The ſpawn ſhould be placed in lumps four or five inches aſunder, in the ſloping ſides of the bed, and covered with a little rich earth; the whole muſt then be covered with a thick coat of ſtraw. When theſe beds are made in ſpring or autumn, as the weather in thoſe months is temperate, the ſpawn will take ſoon, and the muſhrooms will appear in about a month after the bed has been made; but when theſe are made in winter, when the weather is cold, or even in ſummer when the weather is very hot, a much longer time will elapſe. The principal thing to be attended to, in the management of theſe beds, is to preſerve them in a proper degree of moiſture and warmth. Therefore, when the weather is very cold or very wet, care muſt be taken to apply a thick covering of dry ſtraw, and when the bed appears dry, a gentle watering muſt be given.

SECT. II. *Fruit Garden.*

239 Fruit to be expoſed to the ſun.

WHERE any fruit, particularly grapes, are ſhaded with leaves, pains ſhould be taken to expoſe them to the rays of the ſun, that they may acquire proper flavour, likewiſe when the cluſters are entangled, they ſhould be diſengaged, that each may have the benefit of the ſun and air.

240 Plant ſtrawberries.

Strawberries may be planted any time this month when the weather is ſhowery. If rain ſhould not fall towards the beginning of the month, the tranſplanting ſhould be deferred, otherwiſe they muſt be watered occaſionally, for ſome time after they are planted. If any were planted into beds in June, they will be in excellent condition for planting out now; but if none were planted out then, the beſt rooted plants produced at the joints of the runners, or offſets from the old plants, ſhould be choſen, and planted at the diſtance of a foot or 15 inches from one another, either in beds, about four feet wide, or in rows along the borders. Moſt kinds of ſtrawberries ſucceed beſt in an open ſituation, but the wood ſtrawberry may be planted under the ſhade of trees or buſhes.

241 Different kinds of ſtrawberries.

The principal kinds of ſtrawberries, are, the ſcarlet or Virginian, white wood, green wood, red wood, large white wood, hautboy, ſtrawberry, large globe hautboy, oblong hautboy, royal hautboy, green hautboy, Chili ſtrawberry, globe Chili, ſugar-loaf Chili, pine apple Chili, Bath Chili, Carolina Chili, white Carolina Chili, Devonſhire Chili, Royal Chili, Dutch Chili, Alpine or proliſic, which produces fruit from June to November, red Alpine, white Alpine, ſcarlet Alpine, pine-apple ſtrawberry, red, white, and green.

About the end of the month, moſt of the late pears and apples will be fit for taking down, to be laid up for keeping. See OCTOBER.

SECT. III. *Flower Garden, or Pleaſure Ground.*

October. Kitchen Garden.

TRANSPLANT and propagate fibrous-rooted perennial plants by ſlips.

242 Tulips, &c. planted.

Towards the end of the month, hyacinths, tulips, and other bulbs, may be planted. See OCTOBER.

SECT. IV. *Nurſery.*

243 Tranſplant and propagate evergreens, &c.

TRANSPLANT evergreens towards the end of the month, ſuch as Portugal laurels, lauruſtinus, arbutus, &c.

Both evergreens and deciduous trees and ſhrubs may be propagated by layers or cuttings about the end of the month.

SECT. V. *Green-houſe and Hot-Houſe.*

244 Tender plants taken into the houſe.

ABOUT the end of the month, if the weather be cold, orange and lemon trees, and many of the tenderer kinds of green-houſe plants, ſhould be removed into the houſe.

245 Tan-bed renewed.

About the end of this month or beginning of next, the tan-bed in the hot-houſe ſhould be refreſhed with a quantity of new tan, one half or two-thirds according as the old tan may be more or leſs decayed.

OCTOBER.

SECT. I. *Kitchen Garden.*

246 Plant out lettuces.

PLANT out ſome of the lettuces that were raiſed in Auguſt, into a well ſheltered border, or into a hot-bed frame, to ſupply the table during winter and ſpring.

247 Cauliflowers under frames.

Cauliflowers that were planted out laſt month from the ſeed-bed, may now be planted under hot bed frames, at the diſtance of about four inches from one another, or under bell or hand glaſſes. Four or five plants may be put under each hand glaſs, all of which (ſhould they ſurvive the winter) may again be planted out in the ſpring, except one, or at moſt two, of the ſtrongeſt, which ſhould be allowed to remain and produce heads. See FEBRUARY.

Propagate aromatic vegetables by ſlips, ſuch as thyme, mint, balm, ſage, &c.

248 Dreſs aſparagus.

Aſparagus beds ſhould receive their winter dreſſing, i. e. their ſtalks ſhould be cut down, and the alleys between the beds ſhould be dug, and a little of the earth from the alleys ſpread over the ſurface of each bed. Aſparagus beds require ſome dung once every two years, which ſhould be applied at this ſeaſon. Before the alleys are dug, a little well rotten dung ſhould be ſpread over the ſurface of the beds, dug in with a fork, and covered with a little of the earth from the alleys. Where forced aſparagus is required early in winter, a hot-bed may be made any time this month. See JANUARY.

Plant ſome early Mazagan beans, and hotſpur peas, about the end of the month, to ſtand the winter, and produce a crop early in ſummer.

SECT. II. *Fruit Garden.*

249 Gather winter apples.

WINTER pears and apples ſhould in general be gathered this month. Some will be fit to take down the beginning

October. Fruit Garden.

beginning of the month, others will not be ready before the middle or towards the end. To know when the fruits have had their full growth, ſome of them ſhould be tried in different parts of the tree, by turning them gently upwards; if they quit the tree eaſily, it is a ſign of maturity, and time to gather them. But none of the more delicate eating pears ſhould be permitted to hang longer on the trees than the middle of the month, eſpecially if the nights prove froſty; for if they are once touched with the froſt, it will occaſion many of them to rot before they are fit for the table: and therefore, in general, let neither apples nor pears remain longer on the trees than the middle or the end of this month, for they will not improve by hanging on the trees after that time. The beſt apples and pears which are intended for long keeping, ſhould be taken down one by one, on a dry day, and carefully put into baſkets, to be carried to the fruitery, or place where they are to be ſtored up. The fruit themſelves ſhould be dry when taken down from the trees, therefore ſhould not be gathered too early in the morning, before the dew on their ſurface has evaporated. They ſhould be laid in a heap for ten days or a fortnight, that their watery juices may tranſpire; each ſhould then be thoroughly dried with a cloth, and laid on the ſhelves of the fruitery, or in boxes or hampers well covered with dry ſtraw or hay.

250 Prune and plant fruit trees.

About the end of the month, apricots, peaches, and nectarines may be pruned. See JANUARY.

All ſorts of fruit trees may be planted, ſuch as apricots, peaches, nectarines, plums, cherries, apples, pears, quinces, vines, figs, mulberries, medlars, ſervices, filberts, &c. The ground for this purpoſe ſhould be trenched to the depth of one or two ſpades, and ſhould be well manured. If the borders on which the fruit trees are to be planted have not a ſufficient depth of ſoil, a quantity of good earth may be added. Peaches, nectarines, apricots, plums, and cherries, are commonly planted at the diſtance of about fifteen feet from one another. Pears and apples when engrafted on dwarf ſtocks may be planted about the ſame diſtance, but thoſe which are on free ſtocks, about eighteen or twenty feet. Cherries and plums for ſtandards ſhould be planted at the diſtance of twenty or twenty-five feet from one another. Apples and pears, on free ſtocks, ſhould be planted in rows, thirty or forty feet aſunder, and at the diſtance of twenty-five or thirty feet from one another in the row. Dwarf apples and pears, however, may be planted at leſs than half that diſtance.

The principal kinds of apricots are, the early muſcadine, Turkey, Bruſſels, Roman, Breda, orange, Algiers, royal, Moor-park, alberget, tranſparent, Dunmore, or apricot peach, and Portugal.

The principal ſorts of peaches are, the red magdalen, white magdalen, red nutmeg, white nutmeg, nobleſs, early Newington, old Newington, great French mignone, ſmall mignone, admirable chancellor, Millet's mignone, incomparable, violet native, purple native, Royal George, Montauban, teton de Venus, round tranſparent, Catharine, and bloody peach.

The principal kinds of nectarines are, early nutmeg, Newington, red, Roman, violet, muſk, golden, ſcarlet, Elruge, Temple, Murray, Brugnion, white Italian.

The principal ſorts of plums are, the Primordan or early white, Precoce or early black, early Morocco, Orleans, green gage, la royale, damas de Tour, damas violette, white bonum magnum or egg plum, red bonum magnum or Imperial, Perdrigron white, Perdrigron violet, Monſieur plum, drap d'or, royal dauphin, Fotheringham, azure native, or early blue gage, queen mother, myrobalan, apricot plum, red, white, diaprée, Monſieur native, Roche carbon, Jaune native, groſſe queen Claude, petite queen Claude, imperiale violette or blue imperial, petite mirabille, damas muſque, diaprée noire, diaprée violette, imperitrice blanche or white empreſs, imperitrice noire or late black, Spaniſh damas, damas of September, St Catharine, common damſon, Bullace.

October. Fruit Garden.

The principal kinds of cherries are, the early May, May-duke, arch-duke, Harriſon's duke, white heart, black heart, bleeding heart, Adams's crown heart, Hertfordſhire heart, ox heart, Turkey, carnation, amber, Kentiſh or Flemiſh, Portugal, morella, white croſſian, black coroun, ſmall black guigne or geen, ſmall red guigne, ſmalleſt wild black of the woods and hedges, ditto red.

251 Apples.

The principal kinds of apples are, the common codlin, Kentiſh codlin, Dutch codlin, Margaret, golden pippin, gold rennet, Holland pippin, Kentiſh pippin, nonpareil, royal ruſſet, Wheeler's ruſſet, golden ruſſet, gray ruſſet, winter pearmain, ſcarlet pearmain, Loan's pearmain, aromatic ruſſet, pomme d'Appis, Newton pippin, Engliſh rennet, autumn rennet, winter queening, margille, noneſuch, gray Leadington, Marget, tender rennet, kitchen rennet, large white, Italian, Spaniſh rennet, Canada rennet, groſſe rennet de Normandie, Fearns pippin, white French rennet, cluſter pearmain, lemon pippin, French pippin, winter greening, winter pippin, Flanders pippin, white coſtin, Kirton pippin, ſtone pippin, courpendu or hanging body, courpendu red, rambour ſummer, rambour winter, rennet griſe, French rennet, cat's head, leather-coat, ruſſet of winter, pomme de gelée, Siberian crab, American cherry crab, two years apple hanging on the trees, if permitted, till the ſecond year.

252 Pears.

The principal kinds of pears are, the green miſſal, Catharine, jargonelle, cuiſſe madame, Windſor chamontelle, creſſane, echaſſerie, graſſe blanquette, beuré de roi, white beuré, winter beuré, colmar, St Germain, lent St Germain, Martinſee, graſſe muſcat, autumn muſcat, orange bergamot, Hambden's, bergamot, red beuré, golden beuré, brown beuré, great rouſſelet, petit rouſſelet, Holland bergamot, verte longue, winter bonchretien, ſummer ditto, Spaniſh ditto, Meſſieur Jean, Green ſugar, la marquis, ſwan egg, virgleuſe, Portugal, gray goodwife, citron de carmes, ambrette, royal d'hiver, St Michael, Louiſe bonne, ſummer orange, winter orange, Swiſs bergamot, devionett.

Baking pears. Large black pear of Worceſter, Parkinſon's warden, Uvedale St Germain, cadillac. The principal kinds of quinces are the Portugal, apple quince, pear quince. The principal kinds of mulberries are the common black, white, red, medlars, Dutch, Nottingham or Engliſh. Services. Common wild ſervice, bervey, ſweet ſervice or ſerb, apple-ſhaped, pear-ſhaped, berry-ſhaped.

253 Figs.

The principal ſorts of figs are, the common blue, early long blue, early white, large white, large Genoa, Brunſwiek, Marſeilles, Cyprian, brown Iſchia, brown Malta.

November. Kitchen Garden.

Malta. Filberts. Large red ſkinned filbert, white ſkinned, common hazel nut, Barcelona nut, cob nut, cluſter nut, Byzantine nut.

Gooſeberries, currants, and raſpberries, may likewiſe be planted about the end of this month. See JANUARY.

SECT. III. *Flower Garden*, or *Pleaſure Ground.*

254 Bulbous roots planted.

BULBOUS-rooted plants, ſuch as tulips, hyacinths, narciſſus, jonquils, crocus, dens-canis, crown imperial, ſword lily, ixia, Perſian and Engliſh iris, ranunculus, and anemone, may be planted any time this month, either in beds by themſelves, or in flower borders, together with other flowers; but the finer ſorts of tulip, hyacinths, ranunculus, and anemone, are commonly planted in beds, ſix or eight inches diſtant, and two or three deep.

Plant out deciduous and evergreen trees and ſhrubs. The method of planting all theſe is to open a circular hole, wide enough to receive the roots, and about a ſpade deep, more or leſs, according to the length of the roots.

Thorn and other hedges may be planted towards the end of this month, or any time in the courſe of the next.

SECT. IV. *Nurſery.*

255 Sow ſtone fruit, &c.

Sow haws, holly berries, hips, barberries, yew-berries, acorns, beech-maſts, maple and aſh-ſeed, cherry and plum ſtones, in a bed about four feet wide. It is a common practice to keep haws and hips, in heaps covered over with earth for twelve months; for thoſe which are ſown without this preparation frequently lie a whole year in the ſeed-bed without coming above ground. Plant cuttings of laurels and evergreens.

SECT. V. *Green-houſe and Hot-houſe.*

THE hardier kinds of green-houſe plants ſhould be all removed into the green-houſe, when they ſhould have plenty of air, except in very cold or wet weather.

The ſucceſſion pine-apple plants ſhould be removed into the fruiting houſe, which ſhould previouſly receive a quantity of new tan, as directed laſt month. The younger ſucceſſion plants likewiſe ſhould be moved into the place of thoſe that have been transferred into the fruiting houſe, air ſhould be given freely in mild weather, and water very moderately.

NOVEMBER.

SECT. I. *Kitchen Garden.*

256 Blanch endive, &c.

TIE up endive for blanching, continue to earth-up cardoons, and dreſs the plantations of artichokes, i. e. cut down their larger leaves, and lay ſome earth about the plants, to protect them during winter.

Carrots and parſneps may be taken up, and preſerved in ſand during the winter.

Some more peas and beans may be ſown to ſucceed thoſe that were ſown laſt month, or to ſupply their place if they ſhould be cut off by the ſeverity of the weather.

November. Fruit Garden.

SECT. II. *Fruit Garden.*

257 Prune vines.

The beſt time for pruning vines is immediately after the fall of the leaf, becauſe the greateſt poſſible time in that way is allowed for healing the wounds. Vines that are cut about the time of the riſe of the ſap in the ſpring, are apt to bleed profuſely; this happens ſometimes even to thoſe that are pruned in the courſe of the winter. It is a common error, in pruning vines, to allow the branches to grow too cloſe together, particularly in thoſe varieties which grow vigorouſly, and have very large leaves; for, in ſummer, when the leaves are fully expanded, they are ſo much crowded together as to exclude the rays of the ſun from the fruit. When pruning is properly performed, the young branches ſhould be left at the diſtance of from one foot or two feet, and even upwards, from one another; but this in a great meaſure muſt be regulated by the ſize of their leaves. The Syrian grape has leaves about a foot and a half broad, with foot-ſtalks ſix inches long. The black Hamburgh has leaves twelve or thirteen inches broad, with foot-ſtalks ſeven inches long. The black cluſter on the contrary has leaves five inches broad, with foot-ſtalks three inches long. Blue frontignac and claret grape have leaves ſix inches broad, with foot-ſtalks about four inches long. When vines are weakly, each ſhoot ſhould be ſhortened ſo as to leave only three or four eyes; when they are moderately vigorous, each ſhould be left about a foot long. When very vigorous, ſome of the ſhoots may be left three or four feet long or more; the ſhoots of vines, however, that are trained to the rafters of a vinery or pine-ſtove may be left eighteen or twenty feet long. It has been obſerved, that both the largeſt grapes and fineſt cluſters are produced on ſhoots of a conſiderable length. When vines have been allowed to run into confuſion, much time and pains are requiſite to reduce them to regularity; but when they have been trained regularly from the beginning, pruning is eaſily and expeditiouſly performed.

258 Directions for training vines.

If the following directions for training vines in a vinery be obſerved, they will eaſily be kept in order, and plentiful crops of good fruit may be expected.

Vines may be planted both on the back wall and front of a vinery; thoſe on the back wall ſhould be planted from ſix to twelve feet aſunder, according to the vigour of growth of the particular ſort, and in ſuch a poſition that the two uppermoſt buds may point eaſt and weſt; thoſe on the front ſhould be planted ſo as one may be trained to each rafter. When the vines begin to grow, all the buds except the two uppermoſt muſt be rubbed off from thoſe on the back wall, and all except the uppermoſt from thoſe on the front wall. If any of the plants ſhew fruit the firſt year, the cluſters ſhould be rubbed off, as well as the tendrils and lateral ſhoots, and the principal ſhoots ſhould be trained regularly to the trellis as they advance in growth. Fires ſhould be put in the vinery during the ſpring, to encourage an early growth in the vines, that they may have full time to ripen their wood. In the month of June the glaſſes may be taken off altogether, but ſhould be put on again in September, and continued till the fall of the leaf, when the vines ſhould be pruned. The two ſhoots which each vine on the back wall was permitted to puſh, ſhould be cut down to their third or fourth bud, according

November. Fruit Garden.

according as either of them appears fulleſt and ſtrongeſt, and then bent down as near as poſſible to a horizontal poſition, forming a figure reſembling the letter T. Plants in front that are trained to the rafters, ſhould be cut down almoſt to the bottom, and no more left than is merely ſufficient to train them to the rafter. Only two ſhoots ſhould again be permitted to grow on each plant on the back wall, and one on thoſe of the front, and theſe may be allowed to run the whole height of the houſe before they are ſtopped. After the vine ſhoots are ſtopped (which is done by pinching off their tops), they will in general puſh out laterals at three or four eyes, on the upper part of the ſhoot. Theſe laterals ſhould not entirely be taken off, as it would cauſe more eyes lower upon the ſhoots to puſh out. It would therefore be prudent to permit the firſt laterals to grow twelve or fourteen inches, and then to pinch off their tops. Theſe laterals, in their turn, will puſh out ſecondary laterals, which ſhould be pinched off at the ſecond or third joint, and in that way the ſap may be diverted till the end of the ſeaſon.

The ſhoots of the plants on the back wall muſt be brought down to a horizontal poſition, and cut ſo that the branches of each plant may reach within a foot of the other. If all the vines on the rafters have puſhed vigorouſly, it will be proper to prune every other plant down to three or four eyes, and the reſt to from twenty to twenty-five eyes each, the latter being intended to produce fruit, and the former to make bearing wood againſt another year. When the vines begin to puſh in the ſpring of the third year, the ſhoots of thoſe on the back wall ſhould not be allowed to ſtand nearer one another than a foot or fifteen inches, all the intermediate buds being carefully rubbed off. The ſhoots ought to be trained up perpendicularly, and however vigorous they may be, no more than one cluſter ſhould be allowed to remain on any of them: all of them may run up to the height of five or ſix feet before they are ſtopped. The ſhoots on the rafters, that were pruned to twenty or twenty-five eyes each, will probably puſh at all of them; but not more than five or ſeven ſhoots ſhould be permitted to remain, even on the ſtrongeſt; viz. a leading ſhoot, and two or three on each ſide. Care being taken to leave one ſhoot as near the bottom as poſſible, as the whole branch will require to be pruned down to this ſhoot next winter. Only one ſhoot ſhould be left upon thoſe vines that were pruned down to three or four eyes, at every other rafter; and this muſt be trained up the rafter as in the preceding year. At next pruning ſeaſon all the ſhoots proceeding from the horizontal branches of the vines in the back wall ſhould be pruned down to three or four eyes. The vines on the front which produced fruit ſhould be pruned to their loweſt ſhoot, which ſhould be ſhortened, ſo as to leave four or five eyes. Thoſe at every other rafter which were ſhortened the preceding year, and which were allowed to puſh one ſhoot, ſhould now be pruned like the bearers of the former year; i. e. twenty or twenty-five eyes ſhould be left on each. In the following and all ſucceeding ſeaſons, theſe vines on the front will require a ſimilar management, with this difference, that, as they acquire more ſtrength, they may be permitted to puſh more ſhoots, and more cluſters may be allowed to remain on each ſhoot; for, as the vines advance in age, they will certainly be enabled to produce every year for a certain period, a larger crop of fruit. The ſpurs of the vines on the back-wall, i. e. the ſhoots that were ſhortened to three or four eyes, ſhould be allowed to puſh up one ſhoot: theſe ſhoots at next pruning ſeaſon muſt be cut ſo as to leave a long one, viz. about four feet, and a ſhort one, alternately. The long ones ſhould be allowed to puſh five ſhoots (all the other buds being rubbed off), the four lateral of which ſhould be cut down to two or three eyes each, at next pruning ſeaſon, and the terminal one ſhould be left about a foot and a half long. The ſhort ſhoots between the long ones muſt conſtantly be pruned down to two or three eyes each, in order to keep up a proper ſucceſſion of bottom wood. The pruning following ſeaſon muſt be the ſame, with this difference, that the upright ſhoots, as they have acquired a foot and a half additional length, may be allowed to puſh ſeven ſhoots inſtead of five.

November. Flower Garden or Pleaſure Ground.

The principal kinds of vines (E) are, * the white muſcat of Alexandria, * black damaſcus, * golden gallician, *† white frontinac, *† griſly frontinac, *† black or purple frontinac, †‡ blue or violet frontinac, †‡ red frontinac, *† white ſweet water, *† black Hamburgh, *† red Hamburgh, or Gibraltar grape, * white Hamburgh, *† malvoiſe or blue tokay, *† genuine tokay, *† flame-coloured tokay, †‡ brick grape, *† white muſcadine or chaſſelas, *† royal muſcadine or d'arboyce, *† Malmſey grape, *† claret grape, * Syrian, †‡ Burgundy or Munier grape, †‡ ſmall black cluſter, † large black cluſter, †‡ early black July grape or morillon, noir natif, † white parſley-leaved. 259 Different kinds of grapes.

Gooſeberries and currants may be pruned any time from the fall of the leaf, till their buds begin to grow in the ſpring. If theſe buſhes be not well pruned, the fruit will neither be large nor well-flavoured. The principal thing to be attended to is, to keep them open; for they are very apt to become over-crowded with branches: all ſuckers therefore which ariſe from the root, or ſhoots which proceed from the main ſtem, ſhould be removed, becauſe they would only create confuſion, by growing up into the heart of the buſh. When laſt ſummer's ſhoots ſtand too thick, on the main branches, which is frequently the caſe, particularly with gooſeberries, they ſhould be thinned, and few either of them or of the main branches ſhould be ſhortened, becauſe the more they are ſhortened the more liable they are to run to wood. They who make uſe of garden-ſhears, for ſake of expedition, which is too frequently the caſe, may ſave time, and make neat-looking buſhes, but will be diſappointed with reſpect to the quantity and quality of their fruit. 260 Prune gooſeberries and currants.

SECT. III. *Flower Garden*, or *Pleaſure Ground.*

FIBROUS-ROOTED perennial plants may ſtill be planted; likewiſe bulbous-rooted plants, ſuch as tulips, hyacinths, &c.

Shrubs and ornamental or foreſt trees may be tranſplanted

(E) Thoſe marked * are for a hot-houſe; thoſe marked † are for a vinery; and thoſe marked ‡ are for a common wall.

December. Kitchen Garden.

planted now or any time during the winter when the weather is open.

Sect. IV. *The Nurfery.*

Transplant young trees and ſhrubs, and protect tender ſeedlings during ſevere weather.

Sect. V. *Green Houſe and Hot-Houſe.*

The plants in the green-houſe ſhould have air during the day, whenever the weather will permit, and ſhould receive but little water. The plants in the hot-houſe ſhould likewiſe receive air during the day in favourable weather, and fires muſt be put on every evening, but ſeldom need to be continued during the day, except the weather is very ſevere.

DECEMBER.

Sect. I. *Kitchen Garden.*

The cauliflower plants and lettuces planted under hot-bed frames, or under bell or hand-glaſſes, ſhould be expoſed to the air during the mild days, and protected during ſevere weather with a covering of mats or ſtraw. In dry weather celery and cardoons ſhould be earthed up, and endive tied up for blanching.

In this month there is nothing to be done either in the fruit garden, nurſery, green-houſe, or hot-houſe, that has not already been taken notice of in the preceding months.

261 Conſtruction of green-houſes.

Here we ſhall add ſome obſervations on the conſtruction of green-houſes and hot-houſes.

A green-houſe conſtructed for the protection of ſuch vegetables as cannot ſtand in the open air during winter, may vary in form and dimenſions according to the fancy of the proprietor, and the number of plants it is intended to contain. When the front only is of glaſs, which formerly was the only, and even ſtill is the prevalent, mode of conſtructing green-houſes, the pillars between the ſaſhes ought to be as narrow as the weight they have to ſupport will admit of, and formed ſo as to give the leaſt poſſible obſtruction to the light; they may be either of ſtone, brick, wood, or caſt iron. The height of the ſaſhes ſhould equal if not exceed the width of the houſe, that a ſufficient quantity of light may be thrown on the plants which ſtand near the back wall, otherwiſe they will loſe colour, become unhealthy and deformed; for not only the colour, but the vigour, and even the form of vegetables, depends on the light. When one half or the whole of the roof is of glaſs, which ought to be the caſe, there is no neceſſity for attending to the proportion the height ought to bear to the width of the houſe. The ends of the houſe ſhould alſo be of glaſs, unleſs when it is connected with a ſeries of other buildings. The pots containing the plants are commonly ſet on benches, which gradually increaſe in height as they recede from the front; however, when the roof is of glaſs, the arrangement may be different. Every green-houſe ought to be furniſhed with flues; for though many winters may occur in which the application of fire heat may not be neceſſary, yet ſuch intenſe froſts at times prevail as would infallibly kill a great many of the plants: external coverings, it is true, are frequently made uſe of as a protection againſt the ſeverity of the weather, but they do not anſwer the purpoſe equally well, for when the froſt continues long they cannot be applied day and night without doing injury, by excluding air and light; the application of fire-heat is likewiſe neceſſary for baniſhing the damp, which very much injures and frequently deſtroys the plants, during long-continued, dull, rainy weather. The flues in green-houſes are frequently confined to the back wall, but they ought to paſs in front of the houſe likewiſe, becauſe the plants ſituated there are moſt liable to be injured by the ſeverity of the weather.

Conſtruction of Green-houſes, &c.

As fires are ſeldom required, and thoſe but very ſlight ones, merely to baniſh froſt and damp, it will not be neceſſary from economical motives to conſtruct the flues ſo as to throw off the greateſt poſſible quantity of heat; they may therefore be concealed, that they may not affect the appearance of the houſe.

Hot-houſes for rearing plants which grow in warmer climates, or for forcing at an early period ſuch vegetables as grow in the open air, vary conſiderably according to the different purpoſes for which they are intended. 1ſt, Conſervatories, or dry ſtoves, ſo called becauſe they are conſtructed without pits for containing tanners bark, oak leaves, or other fermentable ſubſtances, and in which the plants grow in the earth which forms the floor of the houſe, and not in pots. Theſe are commonly of a conſiderable width and height, and are either covered entirely, or at leaſt on the front, roof, and ends, with glaſs. 2dly, Hot-houſes for rearing exotic plants, furniſhed with a pit containing tanners bark, oak leaves, heated ſand, &c. in which pots containing the plants are plunged: theſe likewiſe are of conſiderable breadth and height, and have their front, roof, and ends, covered with glaſs. 3dly, Pine-houſes, which are furniſhed with a pit, as above: theſe are low, the roof being within a few feet of the ſurface of the pit, that the pine plants may be as near the light as poſſible, and the roof and part of the front only need be of glaſs.

Vine-houſes are commonly conſtructed without pits, and are generally about 12 or 14 feet high, ſometimes very narrow, at other times of conſiderable breadth; the former anſwer beſt for forcing at a very early period, and in both houſes the vines are commonly trained both to the back and front.

Peach-houſes are almoſt always conſtructed without pits, are of a moderate height, and vary in breadth. The peaches are trained either to the front or back, or to both; and ſometimes they are planted in the middle of the houſe, and allowed to grow like ſtandard fruit trees, in which caſe the houſe ſhould be capacious.

Cherry and fig-houſes are conſtructed nearly in the ſame way as peach-houſes. The flues for warming all theſe ought to paſs round the front as well as the back of the houſe, and ought to have as much of their ſurface expoſed as poſſible; for the more of the ſurface of the flue comes in contact with the air of the houſe, the more readily the houſe will be warmed: therefore they ought not to be built in contact with the front or back walls when that can be avoided, but ought to be ſupported on pillars of brick to keep them from reſting on the ground.

The furnaces for containing the fuel are placed ſometimes

Conſtruction of Green-houſes, &c.

times in front, ſometimes at the end, but moſt frequently behind the houſe. They ought to be ſituated ſo far below the level of the flue, as is neceſſary to cauſe a ſufficient draught; if this be not attended to, the ſmoke will not paſs through the flues to warm the houſes, but eſcape ſome other way. When the furnaces are about 18 inches high (a common ſize), they ought to be placed about two feet below the level of the flue, that the heated air may have an aſcent of about ſix or eight inches, which will be ſufficient to give the requiſite draught.

When the hot-houſe is of conſiderable extent, it is better to employ ſeveral moderate, than a ſmaller number of ſtrong fires, for violent fires are apt to crack the flues, in which caſe the ſmoke eſcapes into the houſe, and injures the plants. Some are partial to large fires, from an idea that they conſume leſs fuel in proportion; but this is a miſtake, for two moderate fires are found to heat the ſame extent of hot-houſe to an equal degree, and more equably, with a leſs expenditure of fuel than one large one. One moderate fire will be ſufficient for an extent of 500 or 600 ſquare feet of glaſs, but if the houſe is protected with coverings during the night, it will be ſufficient for 700 or 800: thus the number of ſquare feet of glaſs being known, the requiſite number of fires may be eaſily aſcertained. The fires employed for warming hot-houſes may at the ſame time be converted to other uſeful purpoſes. At Billing in Northamptonſhire, the ſeat of Lord John Cavendiſh, the furnaces are conſtructed to burn lime at the ſame time that they heat the hot-houſe. One furnace can burn four buſhels of lime, and conſume about three-fourths of a hundred weight of coal, when lighted only at night and in the morning.

Conſtruction of Green-houſes, &c.

Hot-houſes are ſometimes protected during the winter nights by external coverings of wood or canvas, &c. This renders leſs fire neceſſary; but the ſaving in point of fuel is more than overbalanced by the original expence of the covering, by the trouble of taking it off and putting it on morning and evening, and by the quantity of glaſs broken, particularly when the covering is made of canvaſs, which is apt to be daſhed againſt the glaſs by the wind. When light coverings of cloth are applied internally they are not liable to the laſt-mentioned objection, but there are few hot-houſes where they can be ſo applied.

INDEX TO PART III.

GAR

Gardiner ‖ Garizim.

GARDINER, STEPHEN, biſhop of Wincheſter, and lord chancellor of England, born at Bury St Edmunds in Suffolk, was natural ſon to Richard Woodville, brother to Queen Elizabeth wife to Edward IV. was learned in the canon and civil laws, and in divinity. He ſigned the divorce of Henry VIII. from Katharine of Spain; abjured the pope's ſupremacy; and wrote *De vera et falſa obedientia*, in behalf of the king; yet in Edward's reign he oppoſed the reformation, and was puniſhed with impriſonment; but Queen Mary coming to the throne, ſhe enlarged him. He drew up the articles of marriage between the queen and Philip of Spain, which were very advantageous to England. He was violent againſt the reformers; but on his death-bed was diſſatisfied with his life, and often repeated theſe words: *Erravi cum Petro, ſed non flevi cum Petro.* He died in 1555.

GARGARISM (from γαργαρίζω, "to waſh the mouth;") a gargle. Its uſe is for waſhing the mouth and throat with, when inflammations, ulcerations, &c. are there. A ſmall quantity may be taken into the mouth, and moved briſkly about, and then ſpit out; or if the patient cannot do this to any advantage, the liquor may be injected by a ſyringe. When gargles are required, their uſe ſhould be more frequently repeated than is done in common practice.

GARGET, a diſeaſe of cattle, conſiſting in a ſwelling of the throat and the neighbouring parts; to prevent which bleeding in the ſpring is recommended.

GARGIL, a diſtemper in geeſe, which by ſtopping the head frequently proves mortal. Three or four cloves of garlic, beaten in a mortar with ſweet butter, and made into little balls, and given the creature faſting, are the ordinary cure.

GARIDELLA, a genus of plants belonging to the decandria claſs, and in the natural method ranking under the 26th order, *Multiſiliquæ*. See BOTANY *Index*.

GARIZIM, GERIZIM, or *Geriſim*, in *Ancient Geography*, a mountain of Samaria, at the foot of which ſtood Sichem; ſo near, that Jotham could be heard by the Sichemites from its top, (Judges, ix. 7.). Famous for the temple built on it by Sanballet, in favour of his

GAR

Garizim ‖ Garnet.

ſon in-law Manaſſeh, by the permiſſion of Alexander the Great, and 200 years after deſtroyed by John Hyrcanus, ſon of Simon, the fourth in ſucceſſion of the Aſmoneans (Joſephus).

GARLAND, a ſort of chaplet made of flowers, feathers, and ſometimes precious ſtones, worn on the head in manner of a crown.—The word is formed of the French *guirlande*, and that of the barbarous Latin *garlanda*, or Italian *ghirlanda*. Menage traces its origin from *gyrus* through *gyrulus*, to *gyrulare*, *gyrlandum*, *ghirlandum*; and at length *ghirlanda* and *guirlande*; ſo that *guirlande* and *garland* are deſcended in the ſixth or ſeventh degree from *gyrus*.—Hicks rejects this derivation, and brings the word from *gardel handa*, which in the northern languages ſignify a *noſegay artfully wrought with the hand*.

GARLAND alſo denotes ornaments of flowers, fruits, and leaves, intermixed; anciently much uſed at the gates of temples, where feaſts and ſolemn rejoicings were held; or at any other place where marks of public joy or gaiety were required, as at triumphal arches, tournaments, &c.

GARLIC. See ALLIUM, BOTANY *Index*.

GARMENT, that wherewith any perſon is clothed. See DRESS and HABIT.

GARNET, in *Natural Hiſtory*, a very beautiful gem, of a red colour, with an admixture of blue. See MINERALOGY *Index*.

When pure and free from blemiſhes, it is little inferior in appearance to the oriental ruby, though only of a middle degree of hardneſs between the ſapphire and common cryſtal. It is found of various ſizes, from that of a pin's head to an inch in diameter.

Among lapidaries and jewellers, genuine garnets are known by different names according to their different degrees of colour. 1. The garnet, ſimply ſo called, is the fineſt and moſt valuable kind, being of a very deep blood-red with a faint admixture of blue. 2. The rock-ruby; a name very improperly given to the garnet when it is of a very ſtrong but not deep red, and has a fairer caſt of the blue; this is a very beautiful gem. 3. The ſorane or ſerain garnet; that of a yet brighter red, approaching to the colour of native cinnabar,

Garnet || Garrick.

cinnabar, with a faint blue tinge. 4. The almandine, a garnet only a little paler than that called the *rock-ruby*.

Garnet-Colour. See *Colouring of Glass.*

To imitate Garnets. The making the counterfeit garnet in paſte is done as follows.—Take prepared cryſtal two ounces, common red-lead ſix ounces, manganeſe 16 grains, zaffre three grains; mix all well, put them into a crucible, cover it with lute, and ſet it in a potter's kiln for 24 hours. Or take cryſtal two ounces, minium five ounces and a half, manganeſe 15 grains, zaffre four grains: mix them well together; and let all be baked, in a pot well luted, in a potter's kiln, 24 hours.

GARONNE, a large river of France, which has its ſource in the Pyrenean mountains, runs north-weſt by the city of Thouloufe, divides the provinces of Guienne and Gaſcony, and, viſiting the city of Bourdeaux, falls into the bay of Biſcay, about 60 miles below that city. It has alſo a communication with the Mediterranean, by means of the royal canal of Louis XIV. The tide flows up this river 20 miles above Bourdeaux.

GARRICK, David, Eſq. the great Roſcius of his age and country, who for nearly 40 years ſhone the brighteſt luminary in the hemiſphere of the ſtage, was born at the Angel Inn at Hereford, in the year 1716. His father, Captain Peter Garrick, was a French refugee, and had a troop of horſe which were then quartered in that city. This rank he maintained in the army for ſeveral years, and had a majority at the time of his death; that event, however, prevented him from ever enjoying it. Mr Garrick received the firſt rudiments of his education at the free-ſchool at Litchfield; which he afterwards completed at Rocheſter, under the celebrated Mr Colſon, ſince mathematical profeſſor at Cambridge. Dr Johnſon and he were fellow-ſtudents at the ſame ſchool; and it is a curious fact, that theſe two celebrated geniuſes came up to London in the ſame coach, with the intention of puſhing themſelves into active life. On the 9th of March 1736, he was entered at the honourable ſociety of Lincoln's Inn. The ſtudy of the law, however, he ſoon quitted; and followed for ſome time the employment of a wine merchant: but that too diſguſting him, he gave way at laſt to the irreſiſtible bias of his mind, and joined a travelling company of comedians at Ipſwich in Suffolk, where he went by the name of *Lyddle*. Having in this poor ſchool of Apollo got ſome acquaintance with the theatric art, he burſt at once upon the world, in the year 1740-1, in all the luſtre of perfection, at the little theatre in Goodman's Fields, then under the direction of Henry Giffard.

The character he firſt performed was Richard III. in which, like the ſun burſting from behind a cloud, he diſplayed in the earlieſt dawn even more than meridian brightneſs. His excellence dazzled and aſtoniſhed every one; and the ſeeing a young man, in no more than his 24th year, and a novice in reality to the ſtage, reaching at one ſingle ſtep to that height of perfection which maturity of years and long practical experience had not been able to beſtow on the moſt capital performers of the Engliſh ſtage, was a phenomenon that could not but become the object of univerſal ſpeculation and of as univerſal admiration. The theatres at the weſt end of the town were deſerted; Goodman's Fields, from being the rendezvous of citizens and citizens wives alone, became the reſort of all ranks of men; and Mr Garrick continued to act till the cloſe of the ſeaſon. Garrick.

Having very advantageous terms offered him for the performing in Dublin during ſome part of the ſummer (1741), he went over thither, where he found the ſame juſt homage paid to his merit which he had received from his own countrymen. To the ſervice of the latter, however, he eſteemed himſelf more immediately bound; and therefore in the enſuing winter, engaged himſelf to Mr Fleetwood, then manager of Drury Lane; in which theatre he continued till the year 1745, when he again went over to Ireland, and continued there the whole ſeaſon, joint manager with Mr Sheridan in the direction and profits of the theatre royal in Smock Alley. From thence he returned to England, and was engaged for the ſeaſon of 1746 with Mr Rich at Covent Garden. This was his laſt performance as a hired actor: for in the cloſe of that ſeaſon, Mr Fleetwood's patent for the management of Drury Lane being expired, and that gentleman having no inclination further to purſue a deſign by which, from his want of acquaintance with the proper conduct of it, or ſome other cauſe, he had conſiderably impaired his fortune; Mr Garrick, in conjunction with Mr Lacy, purchaſed the property of that theatre, together with the renovation of the patent; and in the winter of 1747, opened it with the greateſt part of Mr Fleetwood's company, and with the great additional ſtrength of Mr Barry, Mrs Pritchard, and Mrs Cibber, from Covent Garden.

Were we to trace Mr Garrick through the ſeveral occurrences of his life,—a life ſo active, ſo buſy, and ſo full of occurrences as his, we ſhould ſwell this account to many pages. Suffice it to ſay, he continued in the unmoleſted enjoyment of his fame and unrivalled excellence to the moment of his retirement. His univerſality of excellence was never once attacked by competition. Tragedy, comedy, and farce, the lover and the hero, the jealous huſband who ſuſpects his wife without cauſe, and the thoughtleſs lively rake who attacks her without deſign, were all alike his own. Rage and ridicule, doubt and deſpair, tranſport and tenderneſs, compaſſion and contempt; love, jealouſy, fear, fury, and ſimplicity; all took in turn poſſeſſion of his features, while each of them in turn appeared to be the ſole poſſeſſor of his heart. In the ſeveral characters of Lear and Hamlet, Richard, Dorilas, Romeo, and Luſignane; in his Ranger, Bayes, Drugger, Kitely, Brute, and Benedict, you ſaw the muſcular conformations that your ideas attached to them all. In ſhort, Nature, the miſtreſs from whom alone this great performer borrowed all his leſſons, being in herſelf inexhauſtible, this her darling ſon, marked out for her trueſt repreſentative, found an unlimited ſcope for change and diverſity in his manner of copying from her various productions. There is one part of theatrical conduct which ought unqueſtionably to be recorded to Mr Garrick's honour, ſince the cauſe of virtue and morality, and the formation of public manners, are conſiderably dependent upon it; and that is, the zeal with which he aimed to baniſh from the ſtage all thoſe plays which carry with them an immoral tendency,

Garrick. and to prune from thoſe which do not abſolutely, on the whole, promote the intereſts of vice, ſuch ſcenes of licentiouſneſs and liberty, as a redundancy of wit and too great livelineſs of imagination have induced ſome of our comic writers to indulge themſelves in, and to which the ſympathetic diſpoſition of our age of gallantry and intrigue has given ſanction. The purity of the Engliſh ſtage has certainly been much more fully eſtabliſhed during the adminiſtration of this theatrical miniſter, than it had ever been during preceding managements. He ſeems to have carried his modeſt, moral, chaſte, and pious principles with him into the very management of the theatre itſelf, and reſcued performers from that obloquy which had attached to the profeſſion. Of thoſe who were accounted blackguards, unworthy the aſſociation of the world, he made gentlemen, united them with ſociety, and introduced them to all the domeſtic comforts of life. The theatre was no longer eſteemed the receptacle of all vice; and the moral, the ſerious, the religious part of mankind, did not heſitate to partake of the rational entertainment of a play, and paſs a cheerful evening undiſguſted with the licentiouſneſs, and uncorrupted by the immorality, of the exhibition.

Notwithſtanding the numberleſs and laborious avocations attendant on his profeſſion as an actor, and his ſtation as a manager; yet ſtill his active genius was perpetually burſting forth in various little productions in the dramatic and poetical way, whoſe merit cannot but make us regret his want of time for the purſuance of more extenſive and important works. It is certain that his merit as an author is not of the firſt magnitude: but his great knowledge of men and manners, of ſtage effect, and his happy turn for lively and ſtriking ſatire, made him generally ſucceſsful; and his prologues and epilogues in particular, which are almoſt innumerable, poſſeſs ſuch a degree of happineſs, both in the conception and execution, as to ſtand unequalled. His ode on the death of Mr Pelham ran through four editions in leſs than ſix weeks. His Ode on Shakeſpeare is a maſterly piece of poetry; and when delivered by himſelf, was a moſt capital exhibition. His alterations of Shakeſpeare and other authors have been at times ſucceſsful, and at times exploded. The excluſion of the gravediggers ſcene from Hamlet will never be forgotten to him by the inhabitants of the gallery at Drury. Though neceſſary to the chaſteneſs of the ſcene, they cannot bear to loſe ſo much true ſterling wit and humour; and it muſt be owned, that exuberances of that kind, though they hurt the uniformity, yet increaſe the luxuriance of the tree. Among his alterations the following are part: Every Man in his Humour, altered from Ben Johnſon; Romeo and Juliet, Winter's Tale, Catherine and Petruchio, Cymbeline, Hamlet, &c. altered and made up from Shakeſpeare; Gameſters, a comedy, from Shirley; Iſabella, from Southerne. To theſe we add, as original productions, The Farmer's Return, and Linco's Travels, interludes; Guardian, Lethe, Lying Valet, Miſs in her Teens, Male Coquet, Iriſh Widow, and other comedies in two acts; Enchanter, a muſical entertainment; Lilliput: the Chriſtmas Tale is aſcribed to him, and many others.

We now bring him to the period of his retirement in the ſpring of 1776; when, full of fame, with the acquirement of a ſplendid fortune, and growing into years, he thought proper to ſeek the vale of life, to enjoy that dignified and honourable caſe which was compatible with his public ſituation, and which he had ſo well earned by the activity and the merits of his dramatic reign. But very ſhort indeed was the period allotted to him for this precious enjoyment: for on the 20th of January 1779, he departed this life; leaving no one rival in excellence upon earth to compenſate for his loſs, or a hope of our ever meeting with his like again. Garrick ‖ Garter.

GARRISON, in the art of war, a body of forces, diſpoſed in a fortreſs, to defend it againſt the enemy, or to keep the inhabitants in ſubjection; or even to be ſubſiſted during the winter ſeaſon: hence *garriſon* and *winter quarters* are ſometimes uſed indifferently for the ſame thing; and ſometimes they denote different things. In the latter caſe, a garriſon is a place wherein forces are maintained to ſecure it, and where they keep regular guard, as a frontier town, a citadel, caſtle, tower, &c. The garriſon ſhould be always ſtronger than the townſmen.

Du Cange derives the word from the corrupt Latin *garniſio*, which the latter writers uſe to ſignify all manner of munition, arms, victuals, &c. neceſſary for the defence of a place, and ſuſtaining of a ſiege.

Winter quarters ſignify a place where a number of forces are laid up in the winter ſeaſon, without keeping the regular guard.

GARSTANG, a town in Lancaſhire, 227 miles from London. It is near a mile in length, but built in a very irregular manner, with dirty ſtreets, and very indifferent houſes. The population amounts to 731 perſons. The church is a ſtately Gothic ſtructure. By the late inland navigation, it has communication with the rivers Merſey, Dee, Ribble, Ouſe, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Weſtmoreland, Cheſter, &c. W. Long. 2. 42. N. Lat. 53. 52.

GARTER, a ligature for tying up the ſtocking; but particularly uſed for the badge of a noble order of knights, hence denominated the

Order of the GARTER, a military order of knighthood, the moſt noble and ancient of any lay order in the world, inſtituted by Edward III. The knights companions are generally princes and peers; and the king of England is the ſovereign or chief of the order. The number of knights was originally 26; but ſix were added in 1786, on account of the increaſe of the royal family. They are a college or corporation, having a great and little ſeal.

Their officers are a prelate, chancellor, regiſter, king-at-arms, and uſher of the black rod. They have alſo a dean, with 12 canons and petty canons, vergers, and 26 penſioners or poor knights. The prelate is the head. This office is veſted in the biſhop of Wincheſter, and has ever been ſo. Next to the prelate is the chancellor; which office is veſted in the biſhop of Saliſbury, who keeps the ſeals, &c. The next is the regiſter, who by his oath is to enter upon the regiſtry, the ſcrutinies, elections, penalties, and other acts of the order, with all fidelity: The dean of Windſor is always regiſter *ex officio*. The fourth officer is Garter and king-at-arms, being two diſtinct offices united in one perſon.

Garter

Garter. Garter carries the rod and ſceptre at the feaſt of St George, the protector of this order, when the ſovereign is preſent. He notifies the elections of new knights, attends the ſolemnity of their inſtallations, carries the garter to foreign princes, &c. He is the principal officer within the college of arms, and chief of the heralds. See *KING-at-Arms*.

All theſe officers except the prelate have fees and penſions. The college of the order is ſeated in the caſtle of Windſor, within the chapel of St George, and the charter houſe, erected by the founder for that purpoſe. The habit and enſign of the order are, a garter, mantle, cape, george, and collar. The three firſt were aſſigned the knights companions by the founder; and, the george and collar by Henry VIII.

The garter challenges pre-eminence over all the other parts of the dreſs, by reaſon that from it the noble order is denominated; that it is the firſt part of the habit preſented to foreign princes and abſent knights, who, and all other knights-elect, are therewith firſt adorned; and it is of ſo great honour and grandeur, that by the bare inveſtiture with this noble enſign, the knights are eſteemed companions of the greateſt military order in the world. It is worn on the left leg between the knee and calf, and is enamelled with this motto, HONI SOIT QUI MAL Y PENSE; i. e. *Shame to him that thinks evil hereof:* The meaning of which is, that King Edward having laid claim to the kingdom of France, retorted ſhame and defiance upon him that ſhould dare to think amiſs of the juſt enterpriſe he had undertaken, for recovering his lawful right to that crown; and that the bravery of thoſe knights whom he had elected into this order, was ſuch as would enable him to maintain the quarrel againſt thoſe that thought ill of it.

The mantle is the chief of theſe veſtments made uſe of upon all ſolemn occaſions. The colour of the mantle is by the ſtatutes appointed to be blue. The length of the train of the mantle only diſtinguiſhes the ſovereign from the knights companions. To the collar of the mantle is fixed a pair of long ſtrings, anciently woven with blue ſilk only, but now twiſted round, and made of Venice gold and ſilk, of the colour of the robes, with knobs or buttons, and taſſels at the end. The left ſhoulder of the mantle has from the inſtitution been adorned with a large garter, with the device HONI SOIT, &c. Within this is the croſs of the order, which was ordained to be worn at all times by King Charles I. At length the ſtar was introduced, being a ſort of croſs irradiated with beams of ſilver.

The collar is appointed to be compoſed of pieces of gold in faſhion of garters, the ground enamelled blue, and the motto gold.

When the knights wear not their robes, they are to have a ſilver ſtar on the left ſide; and they commonly bear the picture of St George, enamelled on gold, and beſet with diamonds, at the end of a blue ribbon, croſſing the body from the left ſhoulder. They are not to appear abroad without the garter, on penalty of 6s. 8d. paid to the regiſter.

The manner of electing a knight companion into this moſt noble order, and the ceremonies of inveſtiture, are as follow. When the ſovereign deſigns to elect a companion of the Garter, the chancellor belonging to this order draws up the letters, which, paſſing both under the ſovereign's ſign manual and ſignet of the order, are ſent to the perſon by Garter principal king at arms; and are in this manner, or to the ſame effect: "We, with the companions of our moſt noble order of the Garter, aſſembled in chapter, holden this preſent day at our caſtle at Windſor, conſidering the virtuous fidelity you have ſhown, and the honourable exploits you have done in our ſervice, by vindicating and maintaining our right, &c. have elected or choſen you one of the companions of our order. Therefore, we require you to make your ſpeedy repair unto us, to receive the enſigns thereof, and be ready for your inſtallation upon the — day of this preſent month, &c." Garter.

The garter, which is of blue velvet bordered with fine gold wire, having commonly the letters of the motto of the ſame, is, at the time of election, buckled upon the left leg, by two of the ſenior companions, who receive it from the ſovereign, to whom it was preſented upon a velvet cuſhion, by Garter king at arms, with the uſual reverence, whilſt the chancellor reads the following admonition, enjoined by the ſtatutes: "To the honour of God omnipotent, and in memorial of the bleſſed martyr St George, tie about thy leg, for thy renown, this noble garter; wear it as the ſymbol of the moſt illuſtrious order, never to be forgotten or laid aſide; that thereby thou mayeſt be admoniſhed to be courageous; and having undertaken a juſt war, in which thou ſhalt be engaged, thou mayeſt ſtand firm, valiantly fight, and ſucceſsfully conquer." The princely garter being then buckled on, and the word of its ſignification pronounced, the knight elect is brought before the ſovereign, who puts about his neck, kneeling, a dark blue ribbon, whereunto is appendant, wrought in gold within the garter, the image of St George on horſeback, with his ſword drawn, encountering with the dragon. In the mean time, the chancellor reads the following admonition: "Wear this ribbon about thy neck, adorned with the image of the bleſſed martyr and ſoldier of Chriſt, St George, by whoſe imitation provoked, thou mayeſt ſo overpaſs both proſperous and adverſe adventures, that having ſtoutly vanquiſhed thy enemies both of body and ſoul, thou mayeſt not only receive the praiſe of this tranſient combat, but be crowned with the palm of eternal victory." Then the knight elected kiſſes the ſovereign's hand; thanks his majeſty for the great honour done him; riſes up, and ſalutes all the companions ſeverally, who return their congratulations. See a repreſentation of the above inſignia, among others, on the plate belonging to *Orders of KNIGHTHOOD*.

Since the inſtitution of this order, there have been eight emperors and twenty-eight kings, beſides numerous ſovereign princes enrolled as companions thereof. Its origin is ſomewhat differently related. The common account is, that the counteſs of Saliſbury at a ball happening to drop her garter, the king took it up and preſented it to her with theſe words, '*Honi ſoit qui mal y penſe;* i. e. Evil to him that evil thinks. This accident, it is ſaid, gave riſe to the order and the motto; it being the ſpirit of the times to mix love and war together: but as in the original ſtatutes of this order there is not the leaſt conjecture to countenance ſuch a feminine inſtitution, credit cannot be given to this tradition. Camden, Fern, &c. take it

Garter, Garth.

to have been inſtituted on occaſion of the victory obtained by Edward over the French at the battle of Creſſy; that prince, ſay ſome hiſtorians, ordered his garter to be diſplayed, as a ſignal of battle: in commemoration whereof, he made a garter the principal ornament of the order, erected in memory of this ſignal victory, and a ſymbol of the indiſſolubie union of the knights.

It appears from Raſtel's Chronicle, lib. vi. quoted by Granger in the ſupplement to his Biographical Hiſtory, that this order was deviſed by Richard I. at the ſiege of the city of Acre, when he cauſed twenty-ſix knights, who firmly ſtood by him, to wear thongs of blue leather about their legs, and that it was perfected in the nineteenth year of Edward III.

In 1551, Edward VI. made ſome alterations in the ritual of this order: that prince compoſed it in Latin, the original whereof is ſtill extant in his own hand writing. He there ordained, that the order ſhould no longer be called the order of St George, but that of the Garter; and, inſtead of the george, hung at the collar, he ſubſtituted a cavalier, bearing a book on the point of his ſword, with the word *protectio* graven on the ſword, and *verbum Dei* on the book: with a buckle in the left hand, and the word *fides* thereon. Larrey.

GARTER, *principal King at Arms*. This office was inſtituted by Henry V.

Garter, and principal king at arms, are two diſtinct offices united in one perſon: Garter's employment is to attend the ſervice of the order of the garter; for which he is allowed a mantle and badge, a houſe in Windſor caſtle, and penſions both from the ſovereign and knights, and laſtly, fees. He alſo carries the rod and ſceptre at every feaſt of St George, when the ſovereign is preſent, and notifies the election of ſuch as are new choſen; attends the ſolemnity of their inſtallations, takes care of placing their arms over their ſeats; and carries the garter to foreign kings and princes, for which ſervices it has been uſual to join him in commiſſion with ſome peer, or other perſon of diſtinction.

Garter's oath relates only to ſervices being performed within the order, and is taken in chapter before the ſovereign knights. His oath, as king at arms, is taken before the earl marſhal.

GARTER is alſo a term in heraldry, ſignifying the moiety or half of a bend.

GARTH is uſed in ſome parts of England for a little backſide or cloſe. It is an ancient Britiſh word. Gardd, in that language, ſignifies *garden*, and is pronounced and written *garth*. This word is alſo uſed for a dam or wear, &c.

GARTH Men, is uſed in our ſtatutes for thoſe who catch fiſh by means of fiſh garths, or wears. By ſtatute it is ordained, that no fiſher, nor garth men, ſhall uſe any nets or engines to deſtroy the fry of fiſh, &c. 17 Ric. II. cap. 9. The word is ſuppoſed by ſome to be derived from the Scotch word *gart*, which ſignifies *forced* or *compelled*; becauſe fiſh are forced by the wear to paſs in a loop, where they are taken.

GARTH, *Sir Samuel*, an excellent Engliſh poet and phyſician, was deſcended from a good family in Yorkſhire. He was admitted into the college of phyſicians at London in 1693. He at that time zealouſly promoted and encouraged the erecting of the diſpenſary for the relief of the ſick poor, by giving them advice gratis, and medicines at low rates. This work of charity having expoſed him and many other phyſicians to the envy and reſentment of ſeveral perſons of the ſame faculty as well as apothecaries, he ridiculed them, with a peculiar ſpirit and vivacity, in a poem called the *Diſpenſary*, in ſix cantos, highly eſteemed. He was one of the moſt eminent members of the famous ſociety called the *Kit Kat Club*, which conſiſted of noblemen and gentlemen diſtinguiſhed by their excellent parts and affection to the houſe of Hanover. Upon the acceſſion of George I. he was knighted, and made phyſician in ordinary to his majeſty, and phyſician general to the army. Nor were theſe more than juſt rewards even of his phyſical merit. He had gone through the office of cenſor of the college in 1702; and had practiſed always with great reputation, and a ſtrict regard to the honour and intereſt of the faculty, never, ſtooping to proſtitute the dignity of his profeſſion, through mean and ſordid views of ſelf-intereſt, to any, even the moſt popular and wealthy apothecaries. In a ſteady adherence to this noble principle, he concurred with the much celebrated Dr Radcliffe, with whom he was alſo often joined in phyſical conſultations. He had a very extenſive practice, but was very moderate in his views of advancing his own fortune; his humanity and good nature inclining him more to make uſe of the great intereſt he had with perſons in power, for the ſupport and encouragement of other men of letters. He choſe to live with the great in that degree of independency and freedom which became a man poſſeſſed of a ſuperior genius, whereof he was daily giving freſh proofs to the public. One of his laſt performances in polite letters, was his tranſlation of the whole fourteenth book, and the ſtory of Cinnus in the fifteenth book, of Ovid's Metamorphoſes. Theſe, together with an Engliſh verſion of the reſt, were publiſhed in 1717; and he has prefixed an excellent preface to the whole, wherein he not only gives an idea of the work, and points out its principal beauties, but ſhows the uſes of the poem, and how it may be read to moſt profit. The diſtemper which ſeized him the enſuing year, and ended not but with his life, cauſed a general concern; which was particularly teſtified by Lord Lanſdowne, a brother poet, though of a different party, in ſome admirable verſes written on the occaſion. He died, after a ſhort illneſs, which he bore with great patience, in January 1719. Garth.

GARUMNA, or *Garonne*, a noble and navigable river of Gaul, which, riſing from the Pyrenees, formerly bounded Aquitain on the north (Cæſar); but by the new regulation of Auguſtus divided it in the middle, emptying itſelf to the north of Burdegala, in the Aquitanic ocean. Mela obſerves concerning it, that unleſs it is ſwelled by winter rains, or the melting of the ſnow, it is for a great part of the year ſhoaly and ſcarcely navigable; but when increaſed by the meeting tide, whereby its waters are impelled, it is ſomewhat fuller; and the farther the river advances, it is broader, till at length it reſembles a large frith or arm of the ſea, not only bearing large veſſels, but alſo Garumna.

Garumna || Gaſcony.

ſo ſwelling like a raging ſea, toſſes them extremely, eſpecially if the direction of the wind be one way and that of the current another.

GAS, in *Chemiſtry*, a general name for all permanently elaſtic fluids, which are obtained by chemical proceſſes, as *azotic gas*, *muriatic acid gas*, *nitrous gas*. See CHEMISTRY *Index*. It is derived from the German *gaſcht* or *gaſt*, ſignifying an eruption of wind, or the ebullition attending the expulſion of elaſtic fluids from ſubſtances in a ſtate of fermentation or effervescence. It was firſt employed by Van Helmont.

GASCOIGNE, SIR WILLIAM, chief juſtice of the court of king's bench under Henry IV. A moſt learned and upright judge: who being inſulted on the bench by the prince of Wales, afterwards Henry V. with equal intrepidity and coolneſs committed the prince to priſon; and by this ſeaſonable fortitude laid the foundation of the future glory of that great monarch, who from this event dated his reformation from the licentiouſneſs of his youth. It is not well authenticated that the prince ſtruck Sir William, as recorded by Shakeſpeare; but all authors agree, that he interrupted the courſe of juſtice to ſcreen a lewd ſervant. Sir William died in 1413.

GASCOIGNE, *George*, an Engliſh poet of ſome fame in the early part of the reign of Queen Elizabeth, was born at Walthamſtow in Eſſex, of an ancient family, and educated at both univerſities, but principally at Cambridge. From thence he removed to Gray's Inn, and commenced ſtudent of the law; but having a genius too volatile for that ſtudy, he travelled abroad, and for ſome time ſerved in the army in the Low Countries. He afterwards went to France; where he became enamoured of a Scottiſh lady, and married her. Being at length, ſays Wood, *weary of thoſe vanities*, he returned to England; and ſettled once more in Gray's Inn, where he wrote moſt of his dramatic and other poems. The latter part of his life he ſpent in his native village of Walthamſtow, where he died in the year 1578. He had the character of a polite gentleman, an eloquent and witty companion, *et vir inter poetas ſui ſeculi præſtantiſſimus*. His plays, firſt printed ſeparately, were afterwards, with ſeveral other poems, &c. reprinted in two volumes 4to; the firſt volume in 1577, the ſecond in 1587.

GASCOIN, or GASCOIGN, denotes the hinder thigh of a horſe, which begins at the ſtifle, and reaches to the ply or bending of the ham.

GASCONADE, a boaſt or vaunt of ſomething very improbable. The term has its riſe from the Gaſcons, or people of Gaſcony in France, who it ſeems have been diſtinguiſhed for bragging and rhodomontade.

GASCONY, the moſt ſouth-weſt province of France, is bounded by Guienne on the north, by Languedoc on the eaſt, by the Pyrenees which ſeparate it from Spain on the ſouth, and by the bay of Biſcay on the weſt. It had its name from the ancient inhabitants, called *Gaſcones*, or *Vaſcones*; by the moderns *Baſques*, or *Vaſques*. After theſe were ſubdued by the Franks, they had for ſome time dukes of their own, who were ſubject to the dukes of Aquitaine; but both were at laſt diſpoſſeſſed by the kings of France. The country produces corn, wine, fruits, &c. The inhabitants are noted for a corrupt pronunciation; and their tendency to exaggerate their own exploits, has rendered *Gaſconade* a proverbial expreſſion.

Gaſcony || Gaſtric.

GASSENDI, PETER, one of the moſt celebrated philoſophers France has produced, was born at Chanterſier, about three miles from Digne in Provence, in 1592. When a child, he took particular delight in gazing at the moon and ſtars as often as they appeared in clear unclouded weather. This pleaſure frequently drew him into bye places, in order to feaſt his eye freely and undiſturbed; by which means his parents had him often to ſeek, not without many anxious fears and apprehenſions. They therefore put him to ſchool at Digne; where, in a ſhort time, he made ſuch an extraordinary progreſs in learning, that ſome perſons, who had ſeen ſpecimens of his genius, reſolved to have him removed to Aix, in order to ſtudy philoſophy under Feſay, a learned minor friar. This propoſal was ſo diſagreeable to his father, who intended to breed him up in his own way to country buſineſs, as being more profitable than that of a ſcholar, that he would conſent to it only upon condition that he ſhould return home in two years at fartheſt. Accordingly young Gaſſendi, at the end of the appointed time, repaired to Chanterſier; but he had not been long there when he was invited to be profeſſor of rhetoric at Digne, before he was quite 16 years of age; and he had been engaged in that office but three years, when his maſter Feſay dying, he was made profeſſor in his room at Aix. When he had been there a few years, he compoſed his Paradoxical Exercitations; which, coming to the hands of Nicholas Peireſc, that great patron of learning joined with Joſeph Walter prior of Valette in promoting him; and he having entered into holy orders, was firſt made canon of church of Digne and doctor of divinity, and then obtained the wardenſhip or rectorſhip of that church. Gaſſendi's fondneſs for aſtronomy grew up with his years; and his reputation daily increaſing, he was in 1645 appointed royal profeſſor of mathematics at Paris. This inſtitution being chiefly deſigned for aſtronomy, our author read lectures on that ſcience to a crowded audience. However, he did not hold this place long; for a dangerous cough and inflammation of the lungs obliged him, in 1647, to return to Digne for the benefit of his native air.—Gaſſendi wrote againſt the metaphyſical meditations of Deſcartes; and divided with that great man the philoſophers of his time, almoſt all of whom were Carteſians or Gaſſendians. He joined to his knowledge of philoſophy and the mathematics an acquaintance with the languages and a profound erudition. He wrote, 1. Three volumes on Epicurus's Philoſophy; and ſix others, which contain his own philoſophy. 2. Aſtronomical Works. 3. The Lives of Nicholas de Peireſc, Epicurus, Copernicus, Tycho Brahe, Puerbachius, and Regiomontanus. 4. Epiſtles, and other treatiſes. All his works were collected together, and printed at Lyons in 1658, in ſix volumes folio. He died at Paris in 1658, aged 63.

GASTEROSTEUS, the STICKLEBACK, a genus of fiſhes belonging to the order of thoracici. See ICHTHYOLOGY, *Index*.

GAST-HOUND. See *GAZE Hound*.

GASTRIC, in general, ſomething belonging to the ſtomach.

GASTRIC Juice, a thin pellucid liquor, which diſtils from

Gaſtric || Gate.

from certain glands in the ſtomach, for the dilution, &c. of the food. See ANATOMY.

GASTROCNEMIUS, in *Anatomy*. See ANATOMY, *Table of the Muſcles*.

GASTROMANCY, or GASTROMANTIA, a kind of divination practiſed among the ancients by means of words coming or ſeeming to come out of the belly.

The word is Greek, γαστρομαντια, compoſed of γαστηρ, *belly*, and μαντια, *divination*.

There is another kind of divination, called by the ſame name *gaſtromancy*, which is performed by means of glaſſes or other round tranſparent veſſels, within which certain figures appear by magic art. It is thus called, becauſe the figures appear as in the belly of the veſſels.

GASTRORAPHY, in *Surgery*, the operation of ſewing up wounds of the abdomen. See SURGERY.

GASTROTOMY (of γαστηρ, and τεμνω, *I cut*), the operation of cutting open the belly; otherwiſe called the *Cæſarean ſection*. See MIDWIFERY.

GATAKER, THOMAS, a learned critic and divine, was born at London in 1574, and ſtudied at St John's college, Cambridge. He was afterwards choſen preacher at Lincoln's Inn; which he quitted in 1611, for the rectory of Rotherhithe in Surry. In 1620, he made a tour through the Low Countries; and in 1624, publiſhed at London a book, entitled, Tranſubſtantiation declared by the confeſſion of the Popiſh Writers to have no neceſſary foundation in God's Word: he wrote likewiſe a defence of this diſcourſe. In 1642, he was appointed one of the aſſembly of divines, and was engaged with them in writing annotations upon the Bible. He died in July 1654, in the 80th year of his age. Beſides the above works, he publiſhed, 1. A Diſſertation upon the Style of the New Teſtament. 2. *De Nomine Tetragrammata*. 3. *De Diphthongis, ſive Bivocalibus*. 4. An Edition and Tranſlation of the Emperor Marcus Antoninus's Meditations. 5. A Collection of Sermons, in folio; and many other works. His piety and charity were very exemplary; and his modeſty ſo great, that he declined all eccleſiaſtical dignity and court preferments. His extenſive learning was admired by Salmaſius and other great men abroad; his houſe was a private ſeminary for young gentlemen of this nation, and many foreigners reſorted to him to receive advice in their ſtudies.

GATE, in *Architecture*, a large door, leading or giving entrance into a city, town, caſtle, palace, or other conſiderable building. See ARCHITECTURE.

Thebes, in Egypt, was anciently known by the appellation *with a hundred gates*. In ancient Rome there was a triumphal gate, *porta triumphalis*. In modern Rome there is the *jubilee gate*, which is only opened in the year of a grand jubilee.

The gates of London were many of them converted into gaols or priſons, as Ludgate, Newgate, &c. but they are now removed. The leſſer or by-gates are called *poſterns*. Gates, through which coaches, &c. are to paſs, ſhould not be leſs than 7 feet broad, nor more than 12; the height to be $1\frac{1}{2}$ the breadth.

GATE, or GAIT, in the manege, called in French *train*, is uſed for the going or pace of a horſe.

GATE, in a military ſenſe, is made of ſtrong planks, with iron bars, to oppoſe an enemy. They are generally made in the middle of the curtain, from whence they are ſeen, and defended by the two flanks of the baſtions. They ſhould be covered with a good ravelin, that they may not be ſeen or enfiladed by the enemy. Theſe gates, belonging to a fortified place, are paſſages through the rampart, which may be ſhut and opened by means of doors and a portcullis. They are either private or public.

Gate || Gath.

Private gates are thoſe paſſages by which the troops can go out of the town unſeen by the enemy, when they paſs to and from the relief of the duty in the outworks, or from any other occaſion which is to be concealed from the beſiegers.

Public gates are thoſe paſſages through the middle of ſuch curtains, to which the great roads of public ways lead. The dimenſions of theſe are uſually about 13 or 14 feet high, and 9 or 10 feet wide, continued through the rampart, with proper receſſes for foot paſſengers to ſtand in out of the way of wheel carriages.

GATES of Hell. This expreſſion is uſed in Scripture, to denote figuratively either the *grave* or the *powers of darkneſs*, i. e. the devil and his angels.

The Mahometans uſe the expreſſion literally, and ſuppoſe that hell has ſeven gates. The firſt is that where Muſſulmans, who incur the guilt of ſin, will be tormented. The ſecond is for the Chriſtians. The third is for the Jews. The fourth is for the Sabians. The fifth for the Magians or worſhippers of fire. The ſixth for Pagans and idolaters. And the ſeventh for hypocrites, who make an outward ſhow of religion, but have none.

GATESHEAD, in the county of Durham, is as it were the ſuburbs of Newcaſtle, though it lies in another county, being divided by the river Tyne; over which there is a fine ſtone bridge, with an iron gate in the middle, having the arms of Durham on one ſide, and thoſe of Newcaſtle on the other, which is the boundary between the biſhopric and Northumberland. The church is a fine building, with a very high tower, which is ſeen at a great diſtance; and in the church-yard are ſeveral ancient monuments. Few traces of its ancient monaſtery remain, except a ſtone gateway. The population in 1801 amounted to 8597.

GATH, or GETH, in *Ancient Geography*, a celebrated city of the Philiſtines, and one of their five principalities. It is famous for having given birth to Goliath. David made a conqueſt of it in the beginning of his reign over all Iſrael; and it continued ſubject to the kings his ſucceſſors till the declenſion and decay of the kingdom of Judah. Rehoboam rebuilt or fortified it; King Uzziah retook it, and Hezekiah once more reduced it under his ſubjection.

Gath ſtood about five or ſix miles from Jamnia, about 14 ſouth of Joppa, and 32 weſt of Jeruſalem. Hence ſome authors (among whom is F. Calmet) have committed an egregious miſtake in making Gath the moſt ſouthern, and Ekron the moſt northern, of the Philiſtine cities; as if theſe two had been the two boundaries of their dominions, whereas theſe two cities are not above five miles aſunder; and Gaza is the laſt of the five ſatrapies ſouth. And Joſephus (in the place already quoted) expreſſes himſelf plainly enough, when he ſays, that Hezekiah took all the Philiſtine

Gath
||
Gaubius.

cities from Gaza to Gath; there being many more cities of that name, which ſignifies in the Hebrew a *wine preſs*. Several other cities of the name of Geth or Gath are mentioned in Euſebius and St Jerome, whoſe ſituation, according to thoſe authors, plainly ſhows them to have been different places from this, and from each other; beſides thoſe which had an adjunct to diſtinguiſh them.

This city recovered its liberty and luſtre in the time of the prophets Amos and Micah; but was afterwards demoliſhed by Hazael king of Syria, after which it became of but little conſideration till the time of the holy war, when Fulk king of Jeruſalem built a caſtle on its ruins.

GATH Opher, *GATH Epher*, or *Gath*, in the canton of Opher, in Galilee, was the birth-place of the prophet Jonah. Joſhua makes this city to be part of the tribe of Zebulun; and St Jerome, in his preface upon Jonah, ſays, that it was two miles from Sephoris, otherwiſe called *Diocæſarea*.

GATH Rimmon, a city belonging to the tribe of Dan. St Jerome places it ten miles from Dioſpolis on the way from Eleutheropolis. It was given to the Levites of Kohath's family.

GATH Rimmon, was alſo a city in the half tribe of Manaſſeh, on this ſide Jordan, and was alſo given for a place of abode to the Levites of Kohath's family.

GATH Rimmon, was likewiſe a city in the tribe of Ephraim, given to the Kohathites.

GATTON, a village in the county of Surry, 19 miles ſouth from London. It lies under the ſide of a hill going to Reygate; and is ſuppoſed to have been known to the Romans, by reaſon of their coins and other antiquities that have been found here. It is a borough by preſcription; and has ſent members to parliament ever ſince the 29th of Henry VI. It was formerly a large town; but is now a mean village, with a ſmall church, and without either fair or market. It ſends two members to parliament. The population in 1801 amounted to 112.

GAUBIUS, JEROME-DAVID, M. D. profeſſor of medicine at Leyden, and afterwards fellow of the Royal Society of London, was born at Heidelberg in the year 1705. From the Jeſuits he received the rudiments of his education, and was much eſteemed by them on account of his abilities; but his father afterwards ſent him to the orphan houſe of Halle, leſt he ſhould be obliged to abjure his religion. The nature of the diſcipline, however, he here found to be much too ſevere, which induced him to requeſt his father to remove him from it, which was accordingly complied with. His teacher at this hoſpital attributing the diſlike of young Gaubius to the want of genius, urged him to give his ſon ſome mechanical employment; but the father thought proper to indulge his ardent deſire after knowledge, and accordingly ſent him to Amſterdam to ſtudy under his uncle John, who was an eminent phyſician. After proſecuting his medical ſtudies for ſome time at Hordwyk, he reſolved to viſit Leyden, where the immortal Boerhaave was an eminent profeſſor, and whoſe penetrating eye ſoon diſcovered that Gaubius was poſſeſſed of talents above mediocrity. He honoured him with unlimited acceſs to his houſe, delighted in imparting inſtruction to him, and gradually forwarded the cultivation of his mind. He took the degree of doctor at the age of 20, after a diſputation on the nature of ſolids, containing an abſtract of the ſyſtem which he himſelf followed through life.

Gaubius,
Gauden.

He travelled through various parts of Europe, and when he returned to Heidelberg by the way of Straſburgh, he was appointed city-phyſician at Deventer in the province of Overyſſel; but he ſoon after removed to Amſterdam. Boerhaave never loſt ſight of his favourite pupil; for when the infirmities of old age and indefatigable labour made him anxious to reſign his chair, Gaubius on his recommendation was appointed to ſucceed him. He publiſhed his Inſtructions for writing Recipes in the year 1738, by which he acquired great and juſtly merited approbation, as he reduced the art from a mere mechanical to a ſcientific form. His Principles of Noſology is perhaps his moſt maſterly performance, as it evinced that he was highly worthy of ſuch a preceptor. His next publication, which appeared in 1771, was his "Adverſaria varii Argumenti," a work which was particularly intereſting to chemiſts; and his oration on the 200th anniverſary of the academy of Leyden attracted conſiderable notice, as in it he traced out, with his accuſtomed acumen, the chief epochs of the arts and ſciences in Holland.

He was likewiſe the author of numerous and valuable papers in the Tranſactions of the Society of Haerlem, and was editor of many excellent performances, among which we may rank Cramer's *Elementa artis docimaſticæ*; *Albinus de peſagienda vita et morte*, and Swammerdam's Book of Nature, which he partly tranſlated. His literary merit ſpread his fame ſo far beyond the bounds of his native country, that pupils repaired to Leyden from every quarter of Europe. In addition to his widely extended reputation, he was bleſſed with the enjoyment of good health till he was 70 years of age, and died on the 29th of November 1780, in his ſeventy-fifth year.

One work of his, entitled "Inſtitutiones Pathologiæ Medicinalis," was deemed ſo valuable by Profeſſor Ackerman, and of ſuch ſingular advantage in academical lectures, that he gave the world a fourth edition of it, publiſhed at Nuremberg in 1787.

GAUDEN, DR JOSEPH, ſon of John Gauden vicar of Mayfield in Eſſex, was born there in 1605. At the commencement of the civil war, he was chaplain to Robert earl of Warwick; who taking part with the parliament againſt the king, was followed by his chaplain. Upon the eſtabliſhment of the Preſbyterian model of church government, he complied with the ruling powers, and was nominated one of the aſſembly of divines who met at Weſtminſter in 1643, and took the covenant; yet having offered ſome ſcruples and objections to it, his name was afterwards ſtruck out of the liſt. Nor did he eſpouſe the parliament cauſe any longer than they adhered to their firſt avowed principles of reforming only, inſtead of deſtroying, monarchy and epiſcopacy. In this ſpirit he was one of thoſe divines who ſigned a proteſtation to the army againſt the violent proceedings that affected the life of the king: and a few days after his execution publiſhed the famous *Εικων Βασιλικη*, *A Portraiture of his Sacred Majeſty in his Solitude and Sufferings*; which ran through 50 editions in the courſe of a year. Upon the return of Charles II. he was promoted to the ſee of Exeter; and in 1662 was removed to Worceſter, much to his

Gauden || Gavelet

regret, having flattered himſelf with the hopes of a tranſlation to Wincheſter; and his death happened the ſame year. He wrote many controverſial pieces ſuited to the circumſtances of the times, and to his own views from them. The *Eikon Baſilike* above-mentioned he publiſhed as the king's private meditations: though on this point there has been a long controverſy. After the biſhop's death, his widow, in a letter to one of her ſons, calls it *The Jewel;* and ſaid, her huſband had hoped to make a fortune by it; and that ſhe had a letter of a very great man's, which would clear up that he writ it. This aſſertion, as the earl of Clarendon had predicted, was eagerly eſpouſed by the anti-royaliſts, in the view of diſparaging Charles I. But it has been obſerved, that Gauden had too luxuriant an imagination, which betrayed him into a rankneſs of ſtyle in the Aſiatic way; and from thence, as Biſhop Burnet argues with others, it may be certainly concluded, that not he, but the king himſelf, was the true author of the Εικων Βασιλικη; in which there is a nobleneſs and juſtneſs of thought, with a greatneſs of ſtyle, that made it be looked on as the beſt written book in the Engliſh language.

GAVEL, or GABEL, among builders. See GABEL.

GAVEL, in *Law*, tribute, toll, cuſtom, or yearly revenue; of which we had in old time ſeveral kinds. See GABEL.

GAVEL Kind, a tenure or cuſtom belonging to lands in the county of Kent. The word is ſaid by Lambard to be compounded of three Saxon words, *gyfe*, *eal*, *kyn*, "*omnibus cognatione proximis data.*" Verſtegan calls it *gavelkind*, quaſi "give all kind," that is, to each child his part: and Taylor, in his hiſtory of *gavelkind*, derives it from the Britiſh *gavel*, that is, a hold or tenure, and *cenned*, "*generatio* aut *familia*;" and ſo *gavel cenned* might ſignify *tenura generationis*.—It is univerſally known what ſtruggles the Kentiſh men made to preſerve their ancient liberties, and with how much ſucceſs thoſe ſtruggles were attended. And as it is principally here that we meet with the cuſtom of gavelkind (though it was and is to be found in ſome other parts of the kingdom), we may fairly conclude, that this was a part of theſe liberties: agreeable to Mr Selden's opinion, that gavelkind, before the Norman conqueſt, was the general cuſtom of the realm. The diſtinguiſhed properties of this tenure are various: ſome of the principal are theſe: 1. The tenant is of age ſufficient to alienate his eſtate by feoffment, at the age of 15. 2. The eſtate does not eſcheat in caſe of an attainder and execution for felony; their maxim being, "the father to the bough, the ſon to the plough." 3. In moſt places he had the power of deviſing lands by will, before the ſtatute for that purpoſe was made. 4. The lands deſcend, not to the eldeſt, youngeſt, or any one ſon only, but to all the ſons together; which was indeed anciently the moſt uſual courſe of deſcent, all over England, though in particular places particular cuſtoms prevailed.

GAVELET, in *Law*, an ancient and ſpecial ceſſavit uſed in Kent, where the cuſtom of gavelkind continues, by which the tenant, if he withdraws his rent and ſervices due to the lord, forfeits his land and tenements.

The proceſs of the gavelet is thus. The lord is firſt to ſeek by the ſteward of his court, from three weeks to three weeks, to find ſome diſtreſs upon the tenement, till the fourth court; and if at that time he find none, at this fourth court it is awarded, that he take the tenement in his hand in name of a diſtreſs, and keep it a year and a day without manuring; within which time, if the tenant pay his arrears, and make reaſonable amends for the withholding, he ſhall have and enjoy his tenement as before: if he come not before the year and day be paſt, the lord is to go to the next county court with witneſſes of what had paſſed at his own court, and pronounce there his proceſs, to have further witneſſes; and then by the award of his own court, he ſhall enter and manure the tenement as his own: ſo that if the tenant deſired afterwards to have and hold it as before, he muſt agree with the lord; according to this old ſaying: "Has he not ſince any thing given, or any thing paid, then let him pay five pound for his were, e'er he become healder again." Other copies have the firſt part with ſome variation; "Let him nine times pay, and nine times repay." Gavelet || Gauging-Rod.

GAVELET, in London, is a writ uſed in the huſtings, given to lords of rents in the city of London. Here the parties, tenant and demandant, appear by *ſcire facias*, to ſhow cauſe why the one ſhould not have his tenement again on payment of his rent, or the other recover the lands on default thereof.

GAUGAMELA, in *Ancient Geography*, a village of Aturia, lying between the rivers Lycus and Tigris; famous for Alexander's victory over Darius. It is ſaid to have been allowed to Darius Hyſtaſpes for the maintenance of a camel; and hence the name. It was not far from a more conſiderable place called *Arbela;* whence the latter gave the name to the victory. See ARBELA.

GAUGE-POINT of a ſolid meaſure, the diameter of a circle whoſe area is equal to the ſolid content of the ſame meaſure.

GAUGER, a king's officer, who is appointed to examine all tons, pipes, hogſheads, and barrels, of wine, beer, ale, oil, honey, &c. and give them a mark of allowance, before they are ſold in any place within the extent of his office.

GAUGING. See GEOMETRY.

GAUGING-Rod, an inſtrument uſed in gauging or meaſuring the contents of any veſſel. That uſually employed is the four-foot gauging rod. It is commonly made of box, and conſiſts of four rules, each a foot long and about three-eighths of an inch ſquare, joined together by three braſs joints; by which means the rod is rendered four feet long when the four rules are quite opened, and but one foot when they are all folded together. On the firſt face of this rod, marked 4, are placed two diagonal lines: one for beer and the other for wine: by means of which the content of any common veſſel in beer or wine gallons may be readily found, by putting the rod in at the bung hole of the veſſel till it meets the interſection of the head of the veſſel with the ſtaves oppoſite to the bung hole. For diſtinction of this line, there is written thereon, *beer* and *wine gallons*. On the ſecond face, 5, are a line of inches and the gauge-line; which is a line expreſſing the areas of circles, whoſe diameters are the correſpondent inches in ale gallons. At the beginning is written, *ale area*. On the third face, 6, are three ſcales of lines; the firſt, at the end of which is written *hogſhead*, is for finding how many gallons there are in Plate CCXXVIII

a

Gauging-Rod.

a hogſhead when it is not full, lying with its axis parallel to the horizon. The ſecond line, at the end of which is written *B. L.* ſignifying a *butt lying* is for the ſame uſe as that for the hogſhead. The third line is to find how much liquor is wanting to fill up a butt when it is ſtanding: at the end of it is written *B. S.* ſignifying a *butt ſtanding*. In the half of the fourth face of the gauging rod, 7, there are the three ſcales of lines, to find the wants in a firkin, kilderkin, and barrel, lying with their areas parallel to the horizon. They are diſtinguiſhed by letters *F. K. B.* ſignifying a *firkin*, *kilderkin*, and *barrel*.

Uſe of the diagonal lines on this rod. To find the content of a veſſel in beer or wine gallons, put the braſed end of the gauging rod into the bung hole of the caſk, with the diagonal lines upwards, and thruſt this braſed end to the meeting of the head and ſtaves; then with chalk make a mark at the middle of the bung hole of the veſſel, and alſo on the diagonal lines of the rod, right againſt, over one another, when the braſed end is thruſt home to the head and ſtaves: then turn the gauging rod to the other end of the veſſel, and thruſt the braſed end home to the end, as before. Laſtly, See if the mark made on the gauging rod come even with the mark made on the bung hole, when the rod was thruſt to the other end; which if it be, the mark made on the diagonal lines will, on the ſame lines, ſhow the whole content of the caſk in beer or wine gallons.

If the mark made on the bung hole be not right againſt that made on the rod when you put it the other way, then right againſt the mark made on the bung hole make another on the diagonal line; and the diviſion on the diagonal line between the two chalks will ſhow the veſſel's whole contents in beer or wine gallons. Thus, *e. gr.* if the diagonal line of the veſſel be 28 inches four tenths, its contents in beer gallons will be near 51, and in wine gallons 62.

If a veſſel be open, as a half barrel, tun, or copper, and the meaſure from the middle of one ſide to the head and ſtaves be 38 inches, the diagonal line gives 122 beer gallons; half of which, viz. 61, is the content of the open half tub.

If you have a large veſſel, as a tun or copper, and the diagonal line taken by a long rule proves 70 inches; the content of that veſſel may be found thus: Every inch at the beginning end of the diagonal line call ten inches. Thus ten inches becomes 100 inches; and every tenth of a gallon call 100 gallons; and every whole gallon call 1000 gallons.

Example. At 44.8 inches on the diagonal beer line is 200 gallons; ſo that 4 inches 48 parts, now called 44 inches 8-tenths, is juſt two-tenths of a gallon, now called 200 gallons; ſo alſo if the diagonal line be 76 inches and 7-tenths, a cloſe caſk of ſuch diagonal will hold 1000 beer gallons: but an open caſk but half ſo much, viz. 500 beer gallons.

Uſe of the GAUGE Line. To find the content of any cylindrical veſſel in ale gallons; ſeek the diameter of the veſſel in inches, and juſt againſt it on the gauge line is the quantity of ale gallons contained in one inch deep: this multiplied by the length of the cylinder will give its content in ale gallons.

For example, ſuppoſe the length of the veſſel 32.06, and the diameter of its baſe 25 inches; to find what is the content in ale gallons? Right againſt 25 inches on the gauge line is one gallon and .745 of a gallon; which multiplied by 32.06, the length, gives 55.9447 gallons for the content or the veſſel. Gauging-Rod, Gaul.

The bung diameter of a hogſhead being 25 inches, the head diameter 22 inches, and the length 32.06 inches; to find the quantity of ale gallons contained in it?—Seek 25, the bung diameter, on the line of inches, and right againſt it on the gauge line you will find 1.745: take one-third of it which is .580, and ſet it down twice; ſeek 22 inches in the head diameter, and againſt it you will find on the gauge line 1.356; one-third of which added to twice .580 gives 1.6096; which multiplied by the length 32.06, the product will be 51.603776, the content in ale gallons. Note, this operation ſuppoſes, that the aforeſaid hogſhead is in the figure of the middle fruſtum of a ſpheroid.

The uſe of the lines on the two other faces of the rod is very eaſy; you need only put it downright into the bung hole (if the veſſel you deſire to know the quantity of ale gallons contained therein be lying) to the oppoſite ſtaves; and then where the ſurface of the liquor cuts any one of the lines appropriated to that veſſel, will be the number of gallons contained in that veſſel.

GAUL, the name given by the Romans to the country that now forms the kingdom of France.—The original inhabitants were deſcended from the Celtes or Gomerians, by whom the greateſt part of Europe was peopled; the name of *Galli*, or *Gauls*, being probably given them long after their ſettlement in that country. See GALLIA.

The ancient hiſtory of the Gauls is entirely wrapped up in obſcurity and darkneſs; all we know concerning them for a long time is, that they multiplied ſo faſt, that their country being unable to contain them, they poured forth in vaſt multitudes into other countries, which they generally ſubdued, and ſettled themſelves in. It often happened, however, that theſe colonies were ſo moleſted by their neighbours, that they were obliged to ſend for aſſiſtance to their native country. This was always very eaſily obtained. The Gauls were upon every occaſion, ready to ſend forth great numbers of new adventurers; and as theſe ſpread deſolation wherever they came, the very name of *Gauls* proved terrible to moſt of the neighbouring nations.—The earlieſt excurſion of theſe people, of which we have any diſtinct account, was into Italy, under a famed leader, named *Bellovеſus*, about 622 years before Chriſt. He croſſed the Rhone and the Alps, till then unattempted; defeated the Hetrurians; and ſeized upon that part of their country, ſince known by the names of *Lombardy* and *Piedmont*.—The ſecond grand expedition was made by the Cœnomani, a people dwelling between the rivers Seine and Loire, under a general named *Elitonis*. They ſettled in thoſe parts of Italy, now known by the names of *Breſciano*, the *Cremoneſe*, the *Mantuan*, *Carniola*, and the *Venetian*.—In a third excurſion, two other Gauliſh nations ſettled on both ſides of the river Po; and in a fourth, the Boii and Lingones ſettled in the country between Ravenna and Bologna. The time of theſe three laſt expeditions is uncertain. 1 Account of the Gauliſh incurſions into Italy.

The third expedition of the Gauls was more remarkable than any of the former, and happened about 200 years after that of Bellovеſus. The Senones ſettled

Gaul. between Paris and Meaux, were invited into Italy by a Hetrurian lord, and ſettled themſelves in Umbria. Brennus their king laid ſiege to Cluſium, a city in alliance with Rome; and this produced a war with the Romans, in which the latter were at firſt defeated, and their city taken and burnt; but at length the whole army was cut off by Camillus, inſomuch, that not a ſingle perſon eſcaped.

Some other expeditions the Gauls undertook againſt the Romans: in which, though they always proved unſucceſsful, by reaſon of their want of military diſcipline; yet their fierceneſs and courage made them ſo formidable to the republic, that, on the firſt news of their march, extraordinary levies of troops were made, ſacrifices and public ſupplications offered to the gods, and the law which granted an immunity from military ſervice to prieſts and old men, was, for the time, aboliſhed.

2 Expedition againſt the Greeks. Againſt the Greeks, the expeditions of the Gauls were very little more ſucceſsful than againſt the Romans. The firſt of theſe we hear of was about 279 years before Chriſt, in the year after Pyrrhus had invaded Italy. At this time, the Gauls finding themſelves greatly overſtocked at home, ſent out three great colonies to conquer new countries for themſelves. One of theſe armies was commanded by *Brennus*, another by *Cerethrius*, and the third by *Belgius*. The firſt entered Pannonia or Hungary; the ſecond Thrace; and the third marched into Illyricum and Macedonia. Here Belgius at firſt met with great ſucceſs; and enriched himſelf by plunder to ſuch a degree, that Brennus envying him, reſolved to enter the ſame countries, in order to ſhare the ſpoil. In a ſhort time, however, Belgius met with ſuch a total defeat, that his army was almoſt entirely deſtroyed; upon which Brennus haſtened to the ſame place. His army at firſt conſiſted of 150,000 foot and 15,000 horſe: but two of his principal officers revolted, and carried off 20,000 men, with whom they marched into Thrace; where, having joined Cerethrius, they ſeized on Byzantium and the weſtern coaſt of the Propontis, making the adjacent parts tributary to them.—To retrieve this loſs, Brennus ſent for freſh ſupplies from Gaul; and having increaſed his army to 150,000 foot, and upwards of 60,000 horſe, he entered Macedonia, defeated the general who oppoſed him, and ravaged the whole country. He next marched towards the ſtraits of Thermopylæ, with a deſign to invade Greece; but was ſtopped by the forces ſent to defend that paſs againſt him. He paſſed the mountains, however, as Xerxes had formerly done; upon which the guards retired, to avoid being ſurrounded. Brennus then having ordered Acichorius, the next to him in command, to follow at a diſtance with part of his army, marched with the bulk of the forces to Delphi, in order to plunder the rich temple there. This enterpriſe proved exceedingly unfortunate: a great number of his men were deſtroyed by a dreadful ſtorm of hail, thunder, and lightning; another part of his army was deſtroyed by an earthquake; and the remainder, ſomehow or other, imagining themſelves attacked by the enemy, fought againſt each other the whole night, ſo that in the morning ſcarcely one half of them remained. The Greek forces then poured in upon them from all parts; and that in ſuch numbers, that though Acichorius came up in due time with his forces, Brennus found himſelf unable to make head againſt the Greeks, and was defeated with great ſlaughter. He himſelf was deſperately wounded; and ſo diſheartened by his misfortune, that, having aſſembled all his chiefs, he adviſed them to kill all the wounded and diſabled, and to make the beſt retreat they could: after which he put an end to his own life. On this occaſion, it is ſaid that 20,000 of theſe unhappy people were executed by their own countrymen. Acichorius then ſet out with the remainder for Gaul; but, by being obliged to march through the country of their enemies, the calamities they met with by the way were ſo grievous, that not one of them reached their own country. A juſt judgment, ſay the Greek and Roman authors, for their ſacrilegious intentions againſt Delphi.

3 Miſerable fate of the army.

Gaul.

4 Gaul invaded by the Romans. The Romans having often felt the effects of the Gauliſh ferocity and courage, thought proper at laſt, in order to humble them, to invade their country. Their firſt ſucceſsful attempt was about 118 years before Chriſt, under the command of Quintus Marcius, ſurnamed *Rex*. He opened a way betwixt the Alps and the Pyrenees, which laid the foundation for conquering the whole country. This was a work of immenſe labour of itſelf, and rendered ſtill more difficult by the oppoſition of the Gauls, eſpecially thoſe called the Stæni, who lived at the foot of the Alps. Theſe people, finding themſelves overpowered by the conſular army, ſet fire to their houſes, killed their wives and children, and then threw themſelves into the flames. After this Marcius built the city of Narbonne, which became the capital of a province. His ſucceſſor Scaurus alſo conquered ſome Gauliſh nations; and in order to facilitate the ſending troops from Italy into that country, he made ſeveral excellent roads between them, which before were almoſt impaſſable. Theſe ſucceſſes gave riſe to the invaſion of the Cimbri and Teutones; an account of whoſe unfortunate expedition is given under the articles CIMBRI, ROME, TEUTONES, &c.

From this time, the Gauls ceaſed to be formidable to the Romans, and even ſeem to have been for ſome time on good terms with them. At laſt, however, the Helvetii kindled a war with the republic, which brought Cæſar over the Alps, and ended in the total ſubjection of the country. Orgetorix was the firſt cauſe of it; who had engaged a vaſt number of his countrymen to burn their towns and villages, and to go in ſearch of new conqueſts. Julius Cæſar, to whoſe lot the whole country of Gaul had fallen, made ſuch haſte to come and ſuppreſs them, that he was got to the Rhone in eight days; broke down the bridge of Geneva, and, in a few days more, finiſhed the famed wall between that city and Mount Jura, now St Claude, which extended ſeventeen miles in length, was ſixteen feet high, fortified with towers and caſtles at proper diſtances, and a ditch that ran the whole length of it. If his own account of it may be relied upon, he did not ſet out till the beginning of April; and yet this huge work was finiſhed by the ides or 13th of the month: ſo that, ſubtracting the eight days he was acoming, it muſt have been all done in about five days; a prodigious work, conſidering he had but one legion there, or even though the whole country had given him aſſiſtance. Whilſt this was doing, and the reinforcements he wanted were coming, he amuſed the Helvetii,

5 Surpriſing ſucceſs of Julius Cæſar.

Gaul. Helvetii, who had ſent to demand a paſſage through the country of the Allobroges, till he had got his reinforcements; and then flatly refuſed it to them: whereupon a dreadful battle enſued; in which they loſt one hundred and thirty thouſand men, in ſpite of all their valour; beſides a number of priſoners, among whom were the wife and daughter of Orgetorix, the leader of this unfortunate expedition. The reſt ſubmitted, and begged they might be permitted to go and ſettle among the Edui, from whom they originally ſprung; and at the requeſt of theſe laſt, were permitted to go.

The Gauls were conſtantly in a ſtate of variance with one another; and Cæſar, who knew how to make the moſt of theſe inteſtine broils, ſoon became the protector of the oppreſſed, a terror to the oppreſſor, and the umpire of all their contentions. Among thoſe who applied to him for help, were his allies the Edui; againſt whom Arioviſtus, king of the Germans, had joined with the Arverni, who inhabited the banks of the Loire, had taken the country of the Sequani from them, and obliged them to ſend hoſtages to him. Cæſar forthwith ſent to demand the reſtitution of both, and, in an interview which he ſoon after obtained of that haughty and treacherous prince, was like to have fallen a ſacrifice to his perfidy: upon which he bent his whole power againſt him, forced him out of his ſtrong intrenchments, and gave him a total overthrow. Arioviſtus eſcaped, with difficulty, over the Rhine; but his two wives, and a daughter, with a great number of Germans of diſtinction, fell into the conqueror's hand. Cæſar, after this ſignal victory, put his army into winter quarters, whilſt he went over the Alps to make the neceſſary preparations for the next campaign. By this time all the Belgæ in general were ſo terrified at his ſucceſs, that they entered into a confederacy againſt the Romans as their common enemy. Of this, Labienus, who had been left in Gaul, ſent Cæſar notice; upon which he immediately left Rome, and made ſuch diſpatch, that he arrived upon their confines in about fifteen days. On his arrival, the Rhemi ſubmitted to him; but the reſt appointing Galba king of the Sueſſiones general of all their forces, which amounted to one hundred and fifty thouſand men, marched directly againſt him. Cæſar, who had ſeized on the bridge of the Axona, now Aiſne, led his light horſe and infantry over it: and whilſt the others were encumbered in croſſing that river, made ſuch a terrible ſlaughter of them, that the river was filled with their dead, inſomuch that their bodies ſerved for a bridge to thoſe who eſcaped. This new victory ſtruck ſuch terror into the reſt, that they diſperſed themſelves; immediately after which, the Sueſſiones, Bellovaci, Ambiones, and ſome others, ſubmitted to him The Nervii, indeed, joined with the Atrebates and Veromandui againſt them; and having firſt ſecured their wives and children, made a vigorous reſiſtance for ſome time; but were at length defeated, and the greateſt part of them ſlain. The reſt, with their wives and old men, ſurrendered themſelves, and were allowed to live in their own cities and towns as formerly. The Aduatici were next ſubdued; and, for their treachery to the conqueror, were ſold for ſlaves, to the number of 50,000. Young Craſſus, the ſon of the triumvir, ſubdued likewiſe ſeven other nations, and took poſſeſſion of their cities; which not only completed the conqueſt of the Belgæ, but brought ſeveral nations from beyond the Rhine to ſubmit to the conqueror. The Veneti, or ancient inhabitants of Vannes in Brittany, who had been likewiſe obliged to ſend hoſtages to the conqueror, were, in the mean time, making great preparations by ſea and land to recover their liberty. Cæſar, then in Illyricum, was forced to equip a fleet on the Loire; and having given the command of it to Brutus, went and defeated them by land, as Brutus did by ſea; and having put their chief men to death, ſold the reſt for ſlaves. The Unelli, with Veridorix their chief, together with the Lexovii and Aulerci, were about the ſame time ſubdued by Sabinus, and the Aquitani by Craſſus, with the loſs of 30,000 men. There remained nothing but the countries of the Morini and Menapii to be conquered of all Gaul. Cæſar marched himſelf againſt them; but he found them ſo well intrenched in their inacceſſible fortreſſes, that he contented himſelf with burning and ravaging their country; and having put his troops into winter quarters, again paſſed over the Alps, to have a more watchful eye on ſome of his rivals there. He was, however, ſoon after obliged to come to defend his Gauliſh conqueſts againſt ſome nations of the Germans, who were coming to ſettle there, to the number of 400,000. Theſe he totally defeated, and then reſolved to carry his conquering arms into Germany; but for an account of his exploits there, ſee the article GERMANY.

6 A general confederacy againſt him.

7 The Gauls defeated with great ſlaughter.

Gaul.

8 The Gauls revolt, but are ſubdued.

Upon his return into Gaul, he found it labouring under a great famine, which had cauſed a kind of univerſal revolt. Cotta and Sabinus, who were left in the country of the Eburones, now Liege, were betrayed into an ambuſh by Ambiorix, one of the Gauliſh chiefs, and had moſt of their men cut off. The Aduatici had fallen upon Q. Cicero, who was left there with one legion, and had reduced him to great ſtraits: at the ſame time Labienus, with his legion, was attacked by Indutiomarus, at the head of the Rhemi and Senones; but had better luck than the reſt, and by one bold ſally upon them, put them to flight, and killed their general. Cæſar acquired no ſmall credit by quelling all theſe revolts; but each victory coſt the lives of ſo many of his troops, that he was forced to have recourſe to Pompey for a freſh ſupply, who readily granted him two of his own legions to ſecure his Gauliſh conqueſts.

9 A ſecond revolt.

But it was not long before the Gauls, ever reſtleſs under a foreign yoke, raiſed up a new revolt, and obliged him to return thither. His fear leſt Pompey ſhould gain the affections of the Roman people, had obliged him to ſtrip the Gauls of their gold and ſilver, to bribe them over to his intereſt; and this gave no ſmall handle to thoſe frequent revolts which happened during his abſence. He quickly, however, reduced the Nervii, Aduatici, Menapii, and Treviri; the laſt of whom had raiſed the revolt, under the command of Ambiorix: but he found the flame ſpread much farther, even to the greateſt part of the Gauls, who had choſen Vercingetorix their generaliſſimo. Cæſar was forced to leave Inſubria, whither he had retired to watch the motions of Pompey, and, in the midſt of winter and ſnow, to repaſs the Alps into the province of Narbonne. Here he gathered his ſcattered troops with all poſſible ſpeed; and, in ſpite of the hard weather, beſieged and took Noviodunum, now Noyons; and defeated Vercingetorix, who was come to the relief of that place. He

next

Gaul. next took the city of Avaricum, now Bourges, one of the ſtrongeſt in Gaul, and which had a garriſon of 40,000 men; of whom he made ſuch a dreadful ſlaughter, that hardly 800 eſcaped. Whilſt he was beſieging Gergovia, the capital of the Arverni, he was informed that the Nitiobriges, or Agenois, were in arms; and that the Ædui were ſending to Vercingetorix 10,000 men, which they were to have ſent to reinforce Cæſar. Upon this news, he left Fabius to carry on the ſiege, and marched againſt the Ædui. Theſe, upon his approach, ſubmitted, in appearance, and were pardoned; but ſoon after that whole nation roſe up in arms, and murdered all the Italian troops in their capital. Cæſar, at this, was in great ſtraits what meaſures to take; but reſolved at length to raiſe the ſiege of Gergovia, and at once attack the enemy's camp, which he did with ſome ſucceſs; but when he thought to have gone to Noviodunum, or Noyons, where his baggage, military cheſt, &c. were left, he heard that the Ædui had carried it off, and burnt the place. Labienus, juſtly thinking that Cæſar would want his aſſiſtance in the condition he now was, went to join him, and in his way defeated a Gauliſh general named *Camulogenus*, who came to oppoſe his march; but this did not hinder the revolt from ſpreading itſelf all over Celtic Gaul, whither Vercingetorix had ſent for freſh ſupplies, and, in the mean time, attacked Cæſar; but was defeated, and forced to retire to Aleſia, a ſtrong place, now Aliſe in Burgundy, as is ſuppoſed. Hither Cæſar haſtened, and beſieged him; and having drawn a double circumvallation, with a deſign to ſtarve him in it, as he was likely to have done, upon that account refuſed all offers of a ſurrender from him. At length, the long expected reinforcement came, conſiſting of 160,000 men, under four

10 They are again ſubdued. generals: theſe made ſeveral fruitleſs attacks on Cæſar's trenches, but were defeated in three ſeveral battles, which at length obliged Vercingetorix to ſurrender at diſcretion. Cæſar uſed all his priſoners with great ſeverity, except the Ædui and Arverni, by whoſe means he hoped to gain their nations, which were the moſt potent of Celtic Gaul: nor was he diſappointed; for both of them ſubmitted to him, and the former received him into the capital, where he ſpent the winter, after he put his army into winter quarters. This campaign, as it proved one of the hardeſt he ever had, ſo he gained more glory by it than any Roman general had done before: yet could not at all by this procure from the ſervile ſenate, now wholly dedicated to his rival, a prolongation of his proconſulſhip; upon which he is reported to have laid his hand upon his ſword, and ſaid, that that ſhould do it.

He was as good as his word; and the Gauls, upon their former ill ſucceſs, reſolving to have as many ſeparate armies as provinces, in order to embarraſs him the more, Cæſar, and his generals Labienus and Fabius, were forced to fight them one after another; which they did, however, with ſuch ſucceſs, that, notwithſtanding the hardneſs of the ſeaſon, they ſubdued the Bituriges, Carnutes, Rhemi, and Bellovaci, with their general Correus, by which he at once quieted all the Belgic provinces bordering on Celtic Gaul. The next who followed were the Treviri, the Eburones, and the Andes, under their general Dumnacus. The laſt place which held out againſt him was Uxellodunum; which was defended by the two laſt acting generals of the Gauls, Drapes the Senonian, and Luterius the Cadurcean. The place being ſtrong and well garriſoned, Cæſar was obliged to march thither from the fartheſt part of Belgic Gaul; and ſoon after reduced it, for want of water. Here again he cauſed the right hands of all that were fit to bear arms to be cut off, to deter the reſt from revolting afreſh. Thus was the conqueſt of Gaul finiſhed from the Alps and Pyrenees to the Rhine, all which vaſt tract was now reduced to a Roman province under the government of a prætor. During his ſeveral expeditions into Gaul, Cæſar is ſaid to have taken 800 cities; to have ſubdued 300 different nations; and to have defeated, in ſeveral battles, three millions of men, of whom one million were killed, and another taken priſoners.—The hiſtory of the country, from the time of its conqueſt by the Romans to the preſent, is given under the articles ROME and FRANCE.

Gaul. 11 Gaul reduced to a Roman province.

12 Character, &c. of the ancient Gauls. The Gauls were anciently divided into a great number of different nations, which were continually at war with one another, and at variance among themſelves. Cæſar tells us, that not only all their cities, cantons, and diſtricts, but even almoſt all families, were divided and torn by factions; and this undoubtedly facilitated the conqueſt of the whole. The general character of all theſe people was an exceſſive ferocity and love of liberty. This laſt they carried to ſuch an extreme, that either on the appearance of ſervitude, or incapacity of action through old age, wounds, or chronic diſeaſes, they put an end to their own lives, or prevailed upon their friends to kill them. In cities, when they found themſelves ſo ſtraitly beſieged that they could hold out no longer, inſtead of thinking how to obtain honourable terms of capitulation, their chief care very often was to put their wives and children to death, and then to kill one another, to avoid being led into ſlavery. Their exceſſive love of liberty and contempt of death, according to Strabo, very much facilitated their conqueſt by Cæſar; for pouring their numerous forces upon ſuch an experienced enemy as Cæſar, their want of conduct very ſoon proved the ruin of the whole.

The chief diverſion of the Gauls was hunting; and indeed, conſidering the vaſt foreſts with which their country abounded, and the multitude of wild beaſts which lodged in them, they were under an abſolute neceſſity to hunt and deſtroy them, to prevent the country from being rendered totally uninhabitable. Beſides this, however, they had alſo their hippodromes, horſe and chariot races, tilts and tournaments; at all of which the bards aſſiſted with their poems, ſongs, and muſical inſtruments.—For an account of their religion, ſee the article DRUID.

The Gauls were exceſſively fond of feaſting, in which they were very profuſe; as, like all other northern nations, they were great lovers of good eating and drinking. Their chief liquors were beer and wine. Their tables were very low. They ate but little bread, which was baked flat and hard, and eaſily broken in pieces; but devoured a great deal of fleſh, boiled, roaſted, or broiled; and this they did in a very ſlovenly manner, holding the piece in their hands, and tearing it with their teeth. What they could not part by this way, they cut with a little knife which hung at their girdle. When the company was numerous, the *Coryphees*,

Gaul ‖ Gauntlope.

phee, or chief of the feaſt, who was either one of the richeſt, or nobleſt, or braveſt, ſat in the middle, with the maſter of the houſe by his ſide; the reſt took their places next according to their rank, having their ſervants holding their ſhields behind them. Theſe feaſts ſeldom ended without bloodſhed; but if by chance the feaſt proved a peaceable one, it was generally accompanied not only with muſic and ſongs, but likewiſe with dances, in which the dancers were armed cap-a-pee, and beat time with their ſwords upon their ſhields. On certain feſtivals they were wont to dreſs themſelves in the ſkins of beaſts, and in that accompany the proceſſions in honour of their deities or heroes. Others dreſſed themſelves in maſquerade habits, ſome of them very indecent, and played ſeveral antic and immodeſt tricks. This laſt cuſtom continued long after their converſion to Chriſtianity.

GAULANITIS, or GAULONITIS (Joſephus); in *Ancient Geography*, according to the different manner of writing the capital, *Gaulan* or *Gaulon*; the extreme part of Baſhan to the ſouth, and bordering on the tribe of Gad. It was divided into the Superior, which to the eaſt extended to Arabia; and into the Inferior, which lay on the lake of Geneſareth, (Joſephus).

GAULON, or GOLAN, the capital of the Gaulanitis Superior; a Levitical city and place of refuge, (Moſes, Joſhua).

GAULOS, in *Ancient Geography*, a ſmall iſland of Sicily, in the African ſea, adjoining to Melite or Malta; with commodious harbours; a colony of Phœnicians, with a cognominal town. Gaulonitæ, the people, (Inſcription). Now called *Gozo*, five miles to the weſt of Malta.

GAULTHERIA, a genus of plants belonging to the decandria claſs; and in the natural method ranking under the 18th order, *Bicornes*. See BOTANY *Index*.

GAUNT-BELLIED, in the manege, is ſaid of a horſe whoſe belly ſhrinks up towards his flanks.

GAUNTLET. See GANTLET.

GAUNTLOPE, pronounced *Gauntlet*, a military puniſhment for felony, or ſome other heinous offence.

In veſſels of war, it is executed in the following manner. The whole ſhip's crew is diſpoſed in two rows, ſtanding face to face on both ſides of the deck, ſo as to form a line whereby to go *forward* on one ſide, and return *aft* on the other; each perſon being furniſhed with a ſmall twiſted cord, called a *knittle*, having two or three knots upon it. The delinquent is then ſtripped naked above the waiſt, and ordered to paſs forward between the two rows of men, and aft on the other ſide, a certain number of times, rarely exceeding three; during which every perſon gives him a ſtripe as he runs along. In his paſſage through this painful ordeal he is ſometimes tripped up, and very ſeverely handled while incapable of proceeding. This puniſhment, which is called *running the gauntlet*, is ſeldom inflicted, except for ſuch crimes as naturally excite a general antipathy among the ſeamen: as, on ſome occaſions, the culprit would paſs without receiving a ſingle blow, particularly in caſes of mutiny and ſedition. But this mode of puniſhment is now, we believe, rarely or never reſorted to, either in the army or navy.

In the land ſervice, when a ſoldier is ſentenced to run the gauntlope, the regiment is drawn out in two ranks facing each other; each ſoldier, having a ſwitch in his hand, laſhes the criminal as he runs along naked from the waiſt upwards. While he runs, the drums beat at each end of the ranks. Sometimes he runs three, five, or ſeven times, according to the nature of the offence. The major is on horſeback, and takes care that each ſoldier does his duty. Gauntlope ‖ Gay.

GAVIES, or GAURS. See GABRES.

GAVOTTA, or GAVOTTE, is a kind of dance, the air of which has two briſk and lively ſtrains in common time, each of which ſtrains is twice played over. The firſt has uſually four or eight bars; and the ſecond contains eight, twelve, or more. The firſt begins with a minim, or two crotchets, or notes of equal value, and the hand riſing; and ends with the fall of the hand upon the dominant or mediant of the mode, but never upon the final, unleſs it be a rondeau: and the laſt begins with the riſe of the hand, and ends with the fall upon the final of the mode.

Tempi di GAVOTTA, is when only the time or movement of a gavotte is imitated, without any regard to the meaſures or number of bars or ſtrains.—Little airs are often found in ſonatas, which have this phraſe to regulate their motions.

GAURA, a genus of plants belonging to the octandria claſs; and in the natural method ranking under the 17th order, *Calycanthemæ*. See BOTANY *Index*.

GAUSE, or GAWSE, in *Commerce*, a very thin, ſlight, tranſparent kind of ſtuff, woven ſometimes of ſilk, and ſometimes only of thread.—To warp the ſilk for making of gauſe, they uſe a peculiar kind of mill, upon which the ſilk is wound: this mill is a wooden machine, about ſix feet high, having an axis perpendicularly placed in the middle thereof, with ſix large wings, on which the ſilk is wound from off the bobbins by the axis turning round. When all the ſilk is on the mill, they uſe another inſtrument to wind it off again on two beams: this done, the ſilk is paſſed through as many little beads as there are threads of ſilk; and thus rolled on another beam to ſupply the loom.

The gauſe loom is much like that of the common weavers, though it has ſeveral appendages peculiar to itſelf. See LOOM.

There are figured gauſes; ſome with flowers of gold and ſilver, on a ſilk ground: theſe laſt are chiefly brought from China.

GAY, JOHN, a celebrated Engliſh poet, deſcended from an ancient family in Devonſhire, was born at Exeter, and received his education at the free ſchool of Barnſtaple in that county, under the care of Mr William Rayner.—He was bred a mercer in the Strand; but having a ſmall fortune, independent of buſineſs, and conſidering the attendance on a ſhop as a degradation of thoſe talents which he found himſelf poſſeſſed of, he quitted that occupation, and applied himſelf to other views, and to the indulgence of his inclination for the Muſes. In 1712 we find him ſecretary, or rather domeſtic ſteward, to the ducheſs of Monmouth, in which ſtation he continued till the beginning of the year 1714; at which time he accompanied the earl of Clarendon to Hanover, whither that nobleman was deſpatched by Queen Anne. In the latter end of the ſame year, in conſequence of the queen's death, he returned to England, where he lived in the higheſt eſtimation and intimacy of friendſhip with many

Gay. many persons of the first distinction both in rank and abilities.—He was even particularly taken notice of by Queen Caroline, then princess of Wales, to whom he had the honour of reading in manuscript his tragedy of the *Captives;* and in 1726 dedicated his *Fables*, by permission, to the duke of Cumberland.—From this countenance shown to him, and numberless promises made him of preferment, it was reasonable to suppose, that he would have been genteelly provided for in some office suitable to his inclination and abilities. Instead of which, in 1727, he was offered the place of gentleman usher to one of the young princesses; an office which, as he looked on it as rather an indignity to a man whose talents might have been so much better employed, he thought proper to refuse; and some pretty warm remonstrances were made on the occasion by his sincere friends and zealous patrons the duke and duchess of Queensberry, which terminated in those two noble personages withdrawing from court in disgust. Mr Gay's dependencies on the promises of the great, and the disappointments he met with, he has figuratively described in his fable of the *Hare with many friends*. However, the very extraordinary success he met with from public encouragement made an ample amends, both with respect to satisfaction and emolument, for those private disappointments.—For, in the season of 1727-8, appeared his *Beggar's Opera;* the vast success of which was not only unprecedented, but almost incredible.—It had an uninterrupted run in London of 63 nights in the first season, and was renewed in the ensuing one with equal approbation. It spread into all the great towns of England; was played in many places to the 30th and 40th time, and at Bath and Bristol 50; made its progress into Wales, Scotland, and Ireland, in which last place it was acted for 24 successive nights; and last of all it was performed at Minorca. Nor was the fame of it confined to the reading and representation alone, for the card table and drawing room shared with the theatre and closet in this respect; the ladies carried about the favourite songs of it engraven upon their fan mounts; and screens, and other pieces of furniture were decorated with the same. In short, the satire of this piece was so striking, so apparent, and so perfectly adapted to the taste of all degrees of people, that it overthrew the Italian opera, that Dagon of the nobility and gentry, which had so long seduced them to idolatry, and which Dennis, by the labours and outcries of a whole life, and many other writers by the force of reason and reflection, had in vain endeavoured to drive from the throne of public taste. The profits of this piece were so very great, both to the author and Mr Rich the manager, that it gave rise to a quibble, which became frequent in the mouths of many, viz. *That it had made* Rich gay, *and* Gay rich; and it has been asserted, that the author's own emoluments from it were not less than 2000l. In consequence of this success, Mr Gay was induced to write a second part to it, which he entitled *Polly*. But the disgust subsisting between him and the court, together with the misrepresentations made of him as having been the author of some disaffected libels and seditious pamphlets, occasioned a prohibition and suppression of it to be sent from the lord chamberlain, at the very time when every thing was in readiness for the rehearsal of it. A very considerable sum, however, accrued to him from the publication of it afterwards in quarto.—Mr Gay wrote several other pieces in the dramatic way, and many very valuable ones in verse. Among the latter, his *Trivia*, or the *Art of Walking the Streets of London*, though his first poetical attempt, is far from being the least considerable, and is what recommended him to the esteem and friendship of Mr Pope: but as, among his dramatic works, his *Beggar's Opera* did at first, and perhaps ever will, stand as an unrivalled masterpiece, so, among his poetical works, his *Fables* hold the same rank of estimation; the latter having been almost as universally read as the former was represented, and both equally admired. Mr Gay's disposition was sweet and affable, his temper generous, and his conversation agreeable and entertaining. But he had one foible, too frequently incident to men of great literary abilities, and which subjected him at times to inconveniencies which otherwise he needed not to have experienced, viz. an excess of indolence, without any knowledge of economy. So that, though his emoluments were, at some periods of his life, very considerable, he was at others greatly straitened in his circumstances; nor could he prevail on himself to follow the advice of his friend Dean Swift, whom we find in many of his letters endeavouring to persuade him to the purchasing of an annuity, as a reserve for the exigencies that might attend on old age.—Mr Gay chose rather to throw himself on patronage, than secure to himself an independent competency by the means pointed out to him; so that, after having undergone many vicissitudes of fortune, and being for some time chiefly supported by the liberality of the duke and duchess of Queensberry, he died at their house in Burlington gardens, in December 1732. He was interred in Westminister Abbey, and a monument erected to his memory, at the expence of his aforementioned noble benefactors, with an inscription expressive of their regards and his own deserts, and an epitaph in verse by Mr Pope. Gay, Gaza.

GAZA, THEODORE, a famous Greek in the 15th century, was born in 1398. His country being invaded by the Turks, he retired into Italy; where he at first supported himself by transcribing ancient authors, an employment the learned had frequent recourse to before the invention of printing. His uncommon parts and learning soon recommended him to public notice; and particularly to Cardinal Bessarion, who procured him a benefice in Calabria. He was one of those to whom the revival of polite literature in Italy was principally owing. He translated from the Greek into Latin, Aristotle's History of Animals, Theophrastus on Plants, and Hippocrates's Aphorisms; and from the Latin into Greek, Scipio's Dream, and Cicero's Treatise on Old Age. He wrote several other works in Greek and Latin; and died at Rome in 1475.

GAZA, in *Ancient Geography*, a principal city and one of the five satrapies of the Philistines. It was situated about 100 stadia from the Mediterranean, on an artificial mount, and strongly walled round. It was destroyed by Alexander the Great, and afterwards by Antiochus. In the time of the Maccabees it was a strong and flourishing city; but was destroyed a third time by Alexander Jannæus. At present it has a miserable appearance. The buildings are mean, both as to the form and matter. Some remains of its ancient grandeur

Gaza || Gazna.

grandeur appear in the handſome pillars of Parian marble which ſupport ſome of the roofs; while others are diſpoſed of here and there, in different parts of almoſt every beggarly cottage. On the top of the hill, at the north-eaſt corner of the town, are the ruins of large arches ſunk low into the earth, and other foundations of a ſtately building, from whence ſome of the baſhaws have carried off marble pillars of an incredible ſize. The caſtle is a contemptible ſtructure, and the port is ruined. E. Long. 34. 55. N. Lat. 31. 28.

GAZE-HOUND, or *Gaſt-hound*, one that makes more uſe of his ſight than of his noſe. Such dogs are much uſed in the north of England: they are fitter in an open champaign country than in buſhy and woody places. If at any time a well-taught gaze-hound takes a wrong way, he will return upon a ſignal, and begin the chaſe afreſh. He is alſo excellent at ſpying out the fatteſt of a herd; and having ſeparated it from the reſt, will never give over the purſuit till he has worried it to death.

GAZEL, in *Zoology*, a ſpecies of CAPRA. See MAMMALIA *Index*.

GAZETTE, a newſpaper, or printed account of the tranſactions of all the countries in the known world, in a looſe ſheet or half ſheet. This name is with us confined to that paper of news publiſhed by authority. The word is derived from *gazetta*, a Venetian coin, which was the uſual price of the firſt newſpaper printed there, and which was afterwards given to the paper itſelf.

The firſt gazette in England was publiſhed at Oxford, the court being there, in a folio half ſheet, November 7. 1665. On the removal of the court to London, the title was changed to the *London Gazette*. The Oxford gazette was publiſhed on Tueſdays, the London on Saturdays: and theſe have continued to be the days of publication ever ſince.

GAZNA, a city of Aſia, once much celebrated, and the capital of a very extenſive empire; but which is now either entirely ruined, or become of ſo little conſideration, that it is not taken notice of in our books of geography. The city was anciently an empory and fortreſs of Sableſtan, not far from the confines of India. During the vaſt and rapid conqueſts of the Arabs, all this country had been reduced under their ſubjection. On the decline of the power of the caliphs, however, the vaſt empire eſtabliſhed by Mahomet and his ſucceſſors was divided into a number of independent principalities, moſt of which were but of ſhort duration. In the year of the Hegira 384, anſwering to the 994th of the Chriſtian era, the city of Gazna, with ſome part of the adjacent country, was governed by Mahmud Gazni; who became a great conqueror, and reduced under his ſubjection a conſiderable part of India and moſt of Perſia.

This empire continued in the family of Mahmud Gazni for upwards of 200 years. None of his ſucceſſors, however, were poſſeſſed of his abilities; and therefore the extent of the empire, inſtead of increaſing, was very conſiderably diminiſhed ſoon after Mahmud's death. The Seljuks made themſelves maſters of Khoraſan, and could not be driven out; the greateſt part of the Perſian dominions alſo fell off; and in the 547th year of the Hegira, the race of Gazni ſultans was entirely ſet aſide by one Gauri, who conquered Khoſru Shah the reigning prince, and beſtowed his dominions on his own nephew Gayathoddin Mohammed. Theſe new ſultans proved greater conquerors than the former, and extended their dominions farther than even Mahmud Gazni himſelf had done. They did not, however, long enjoy the ſovereignty of Gazna; for in 1218, Jenghiz Khan having conquered the greateſt part of China and almoſt all Tartary, began to turn his arms weſtward, and ſet out againſt the ſultan of Gazna at the head of 700,000 men. Gazna.

To oppoſe this formidable army, Mohammed, the reigning ſultan, could muſter only 400,000 men; and, in the firſt battle, 160,000 of his troops are ſaid to have periſhed. After this victory, Jenghiz Khan advanced; Mohammed not daring to riſk a ſecond battle, the loſs of which would have been attended with the entire ruin of his kingdom. He therefore diſtributed his army amongſt the ſtrongeſt fortified towns he had in his dominions; all of which Jenghiz Khan took one after another. The rapid progreſs of his conqueſts, indeed, almoſt exceeds belief. In 1219 and 1220, he had reduced Zarnuk, Nur, Bokhara, Otrar, Saganak, Uzkant, Alſhaſh, Jund, Tonkat, Khojend, and Samarcand. Mohammed, in the mean time, fled firſt to Bokhara; but on the approach of Jenghiz Khan's army, quitted that place, and fled to Samarcand. When this laſt city was alſo in danger of being inveſted, the ſultan did not think proper to truſt himſelf in it more than in the other, though it was garriſoned by 110,000 of his braveſt troops; and therefore fled through byways into the province of Ghilan in Perſia, where he took refuge in a ſtrong fortreſs called *Fſtabad*. But being alſo found out in this retreat, he fled to an iſland in the Caſpian ſea called *Abſkun*; where he ended his days, leaving his empire, ſuch as it was, to his ſon Jaloloddin.

The new ſultan was a man of great bravery and experience in war; but nothing was able to ſtop the progreſs of the Moguls. In 1220 and 1221, they made themſelves maſters of all the kingdoms of Karazim and Khoraſan, committing everywhere ſuch maſſacres as were never heard of before or ſince that time. In the mean time Jaloloddin aſſembled his forces with the utmoſt diligence, and defeated two detachments of the Mogul army. This happened while Jenghiz Khan was beſieging Bamiyan; but anſwered little other purpoſe, than ſerving to bring upon that city the terrible deſtruction of which an account is given under the article BAMIYAN. Immediately after the reduction of that city, Jenghiz Khan marched towards Gazna; which was very ſtrongly fortified, and where he expected to have found Jaloloddin. But he had left the place 15 days before; and, as Jenghiz Khan's army was much reduced, he might perhaps have ſtood his ground, had it not been for an accident. He had been lately joined by three Turkiſh commanders, each of whom had a body of 10,000 men under his command. After his victories over the Moguls, theſe officers demanded the greateſt ſhare of the ſpoils; which being refuſed, they ſeparated themſelves from the ſultan. He uſed his utmoſt endeavours to make them hearken to reaſon; and ſent ſeveral meſſages and letters to them, repreſenting the inevitable ruin which muſt attend their ſeparation, as Jenghiz Khan

Gazna. was advancing againſt them with his whole army. At laſt they were perſuaded to lay aſide their animoſities; but it was now too late; for Jenghiz Khan, being informed of what paſſed, detached 60,000 horſe to prevent their joining the ſultan's army; who, finding himſelf deprived of this powerful aid, retired towards the river Indus. When he was arrived there, he ſtopped in a place where the ſtream was moſt rapid and the place confined, with a view both to prevent his ſoldiers from placing any hopes of ſafety in flight, and to hinder the whole Mogul army from attacking him at once. Ever ſince his departure from Gazna he had been tormented with a colic: yet, at a time when he ſuffered moſt, hearing that the enemy's vanguard was arrived at a place in that neighbourhood called *Herder*, he quitted his litter, and, mounting a horſe, marched with ſome of his choſen ſoldiers in the night; ſurpriſed the Moguls in their camp; and having cut them almoſt all in pieces, without the loſs of a ſingle man on his ſide, returned with a conſiderable booty.

Jenghiz Khan, finding by this that he had a vigilant enemy to deal with, proceeded with great circumſpection. When he came near the Indus, he drew out his army in battalia: to Jagatay, one of his ſons, he gave the command of the right wing; to Oktay, another ſon, he gave the command of the left: and put himſelf in the centre, with 6000 of his guards. On the other ſide, Jaloloddin prepared for battle like one who had no reſource but in victory. He firſt ſent the boats on the Indus farther off; reſerving only one to carry over his mother, wife, and children: but unluckily the boat ſplit when they were going to embark, ſo that they were forced to remain in the camp. The ſultan took to himſelf the command of the main body of the army. His left wing, drawn up under ſhelter of a mountain which hindered the whole right wing of the Moguls from engaging at once, was commanded by his vizir; and his right by a lord named *Amin Malek*. This lord began the fight; and forced the enemy's left wing, notwithſtanding the great diſparity of numbers, to give ground. The right wing of the Moguls likewiſe wanting room to extend itſelf, the ſultan made uſe of his left as a body of reſerve, detaching from thence ſome ſquadrons to the aſſiſtance of the troops who ſtood in need of them. He alſo took one part of them with him when he went at the head of his main body to charge that of Jenghiz Khan; which he did with ſo much reſolution and vigour, that he not only put it in diſorder, but penetrated into the place where Jenghiz Khan had originally taken his ſtation: but that prince having had a horſe killed under him, was retired from thence, to give orders for all the troops to engage.

This diſadvantage had like to have loſt the Moguls the battle; for a report being immediately ſpread that the enemy had broken through the main body, the troops were ſo much diſcouraged, that they would certainly have fled, had not Jenghiz Khan encouraged them by riding from place to place in order to ſhow himſelf. At laſt, however, Jaloloddin's men, who were in all but 30,000, having fought a whole day with ten times their number, were ſeized with fear and fled. One part of them retired to the rocks which were on the ſhore of the Indus, where the enemy's horſe could not follow them; others threw themſelves into the river, where many were drowned, though ſome had the good fortune to croſs over in ſafety; while the reſt ſurrounding their prince, continued the fight through deſpair. The ſultan, however, conſidering that he had ſcarce 7000 men left, began to think of providing for his own ſafety: therefore, having bidden a final adieu to his mother, wife, and children, he mounted a freſh horſe, and ſpurred him into the river, which he croſſed in ſafety, and even ſtopped in the middle of it to inſult Jenghiz Khan, who was now arrived at the bank. His family fell into the hands of the Moguls; who killed all the males, and carried the women into captivity. Gazna.

Jaloloddin being now ſecurely landed in India, got up into a tree in order to preſerve himſelf from wild beaſts. Next day, as he walked melancholy among the rocks, he perceived a troop of his ſoldiers, with ſome officers, three of whom proved to be his particular friends. Theſe, at the beginning of the defeat, had found a boat in which they had ſailed all night, with much danger from the rocks, ſhelves, and rapid current of the river. Soon after, he ſaw 500 horſe coming towards him; who informed him of 4000 more that had eſcaped by ſwimming over the river; and theſe alſo ſoon after joined the reſt. In the mean time an officer of his houſehold, named *Jamalarrazad*, knowing that his maſter and many of his people were eſcaped, ventured to load a very large boat with arms, proviſions, money, and ſtuff to clothe the ſoldiers; with which he croſſed the river. For this important ſervice Jaloloddin made him ſteward of his houſehold, and ſurnamed him the *Choſen* or the *Glory of the Faith*. For ſome time after, the ſultan's affairs ſeemed to go on proſperouſly: he gained ſome battles in India; but the princes of that country, envying his proſperity, conſpired againſt him, and obliged him to repaſs the Indus. Here he again attempted to make head againſt the Moguls; but was at laſt defeated and killed by them, and a final end put to the once mighty empire of Gazna.

The metropolis was reduced by Otkay; who no ſooner entered the country in which it was ſituated, than he committed the moſt horrid cruelties. The city was well provided with all things neceſſary for ſuſtaining a ſiege; had a ſtrong garriſon, and a brave and reſolute governor. The inhabitants, expecting no mercy from Jenghiz Khan, who they knew had ſworn their ruin, were reſolved to make a deſperate defence. They made frequent ſallies on the beſiegers, ſeveral times overthrew their works, and broke above 100 of their battering rams. But one night, after an obſtinate fight, part of the city walls fell down; and a great number of Moguls having filled up the ditch, entered the city ſword in hand. The governor perceiving all was loſt, at the head of his braveſt ſoldiers ruſhed into the thickeſt of his enemies, where he and his followers were all ſlain. However, Gazna was not entirely deſtroyed, nor were the people all killed; for after the maſſacre had continued for four or five hours, Otkay ordered it to ceaſe, and taxed thoſe who were left alive at a certain rate, in order to redeem themſelves and the city. It does not, however, appear that after this time the city of Gazna ever made any conſiderable figure.—It was taken by the Moguls in the year 1222. Gazna.

GEBRES,

Gebres || Geddes.

GEBRES. See GABRES.

GECCO, in *Natural Hiſtory*, a name given by the Indians to their terrible poiſon, which kills when mixed with the blood even in the ſmalleſt quantity. They ſay that this gecco is a venomous froth or humour vomited out of the mouths of their moſt poiſonous ſerpents; which they procure in this fatal ſtrength, by hanging up the creatures by the tails, and whipping them to enrage them: they collect this in proper veſſels as it falls; and when they uſe it, they either poiſon a weapon with it, or wounding any part of the fleſh introduce the ſmalleſt quantity imaginable into it; and this is ſaid to be immediate death.

GECKO. See LACERTA, ERPETOLOGY *Index*.

GED, WILLIAM, an ingenious though unſucceſsful artiſt, who was a goldſmith in Edinburgh, deſerves to be recorded for his attempt to introduce an improvement in the art of printing. The invention, firſt practiſed by Ged in 1725, was ſimply this. From any types of Greek or Roman, or any other character, he formed a plate for every page, or ſheet, of a book, from which he printed, inſtead of uſing a type for every letter, as is done in the common way. This was firſt practiſed, but on blocks of wood, by the Chineſe and Japaneſe, and purſued in the firſt eſſays of Coſter the European inventor of the preſent art. "This improvement (ſays James Ged the inventor's ſon) is principally conſiderable in three moſt important articles, viz. expence, correctneſs, beauty and uniformity."

In July 1729, William Ged entered into partnerſhip with Willam Fenner, a London ſtationer, who was to have half the profits, in conſideration of his advancing all the money requiſite. To ſupply this, Mr John James, then an architect at Greenwich (who built Sir Gregory Page's houſe, Bloomſbury church, &c.) was taken into the ſcheme, and afterwards his brother Mr Thomas James, a letter founder, and James Ged the inventor's ſon. In 1730, theſe partners applied to the univerſity of Cambridge for printing Bibles and common prayer books by blocks inſtead of ſingle types; and, in conſequence, a leaſe was ſealed to them, April 23. 1731. In their attempt they ſunk a large ſum of money, and finiſhed only two prayer books; ſo that it was forced to be relinquiſhed, and the leaſe was afterwards given up. Ged imputed his diſappointment to the villany of the preſsmen, and the ill treatment of his partners (which he ſpecifies at large), particularly Fenner, whom John James and he were adviſed to proſecute, but declined it. He returned to Scotland in 1736, where he gave his friends a ſpecimen of his performance, by an edition of Salluſt. But being ſtill unſucceſsful, and having failed in obtaining redreſs from Fenner, who died inſolvent, he was preparing again to ſet out for London, in order to join with his ſon James as a printer there, when he died October 19. 1749. Ged's ſon attempted unſucceſsfully, in 1751, to revive this invention; Meſſrs Tilloch and Foulis about the year 1782 practiſed it on a ſmall ſcale at Glaſgow; and of late years many beautiful editions of the claſſics have been printed in this way by Didot of Paris, and Wilſon and Company of London*.

ee *Print-* and *il. Mag.* 67.

GEDDES, ALEXANDER, a learned Scots Catholic divine and eminent bible critic, was born in the pariſh of Ruthven in Banffſhire, in the year 1737. His parents were reſpectable, although not opulent. His father was a farmer, who deemed no trouble too great, in order to procure for his children as liberal an education as poſſible. Both father and mother were of the Catholic perſuaſion, and the only book of conſequence which the former had in his library was an Engliſh tranſlation of the bible, in which young Geddes was inſtructed with ſuch care and attention, that he was able to give an account of the hiſtory of it before he had reached the eleventh year of his age. The firſt inſtructions he received, after thoſe of his parents, were communicated by a ſchool-miſtreſs in the vicinity, by whom he was ſo much diſtinguiſhed, that it became the firſt mental gratification which, in his own opinion, he ever felt. He was next put under the tuition of a young man from the city of Aberdeen, who had been engaged by the *laird* for the education of his own children; and afterwards went to a place called Scalan, in the Highlands, where thoſe were to be trained up who deſigned to devote themſelves to the Catholic prieſthood, and to finiſh their education at ſome foreign univerſity. Here it was, in this obſcure retreat, that Geddes laid the foundation of that intimate acquaintance with the learned languages, by which he was ſo eminently diſtinguiſhed in the ſubſequent part of his life. He went to the Scots univerſity at Paris in the year 1758, and ſoon after began the ſtudy of rhetoric in the college of Navarre. By the ſtrength of his genius and his indefatigable attention, he was ſoon at the head of this claſs, although he had to contend with two veterans, and became the favourite of Vicaire the profeſſor, whoſe friendſhip laſted to the cloſe of life.

Geddes.

Inſtead of entering into the philoſophical claſs at the uſual time, he ſtudied that ſubject at home, in order to faciliate his theological ſtudies, on which he entered under M. M. Buré and de Sauvent, at the college of Navarre, and Lavocat at the Sorbonne was his Hebrew preceptor. So great, or rather aſtoniſhing, was his progreſs, that Profeſſor Lavocat urged him ſtrongly to continue at Paris; but his friends prevailed with him to return to his native country in 1764. His firſt charge as a prieſt was in a Catholic chapel in the county of Angus, from which he removed to Traquair in 1765, and became chaplain to the earl of that name, where he remained for about three years. This ſituation was moſt agreeable to his literary purſuits, as he had unlimited acceſs to a very extenſive library, which greatly aſſiſted him in the proſecution of his darling ſtudies. He left the earl's houſe in the year 1768, and returned to Paris, where he devoted his time during the following winter to the peruſal of books and manuſcripts in the king's libraries, making large extracts from ſcarce copies, particularly ſuch as were in the Hebrew tongue.

In the ſpring of 1769, he returned to his native country, and became paſtor of a congregation at Auchinhalrig in Banffſhire, where he was for ſome time involved in pecuniary difficulties, out of which he was extricated by the liberality of the then duke of Norfolk. Theſe were occaſioned by the debts he incurred in building a new chapel for his flock, and in making the parſon's houſe one of the neateſt and moſt convenient in Scotland. With the view of bettering his circumſtances he commenced farmer; but as he had to borrow money to ſtock his farm, and as the crops failed for three ſucceſſive ſeaſons, he was under the neceſſity of abandoning this ſcheme in a much poorer ſtate than when he

Geddes. first projected it. But his unwearied exertions, joined to the aſſiſtance of friends, again relieved him, and he was enabled to diſcharge every claim againſt him of a pecuniary nature in an honourable manner.

In the year 1779 he reſigned his paſtoral charge at Auchinhalrig, which was a heavy ſtroke to the members of his congregation, as the zeal and diligence with which he diſcharged the duties of his miniſterial function had endeared him to all. He was alſo juſtly eſteemed for his attention to the inſtruction of youth. Next year the univerſity of Aberdeen conferred on him the degree of LL. D. a literary honour which was never beſtowed on any Roman Catholic by that body ſince the Reformation. He afterwards went to London, that he might proſecute his favourite ſtudies with greater facility, and give the world his Engliſh tranſlation of the Old and New Teſtament, to which he had turned his attention for a number of years. He officiated for ſome months after his arrival at the imperial ambaſſador's chapel in Duke-ſtreet, till the term of Eaſter 1782, at which time it was ſuppreſſed by order of the emperor Joſeph II. after which Dr Geddes ſeems to have declined entirely the exerciſe of his clerical functions.

No ſooner had the deſign of Mr Geddes, relative to a new tranſlation of the Bible been made public, than he met with formidable oppoſition from his Catholic brethren; an event which the doctor with good reaſon ſeems to have anticipated. His own words on this occaſion were: "I expect not exceſſive profits from exceſſive exertion. I truſt I ſhall never want *meat*, and *clothes*, and *fire*; to a philoſophical and contented mind, what more is neceſſary?" He was many years employed in preparing this important work for the preſs, before he had any proſpect of adequate ſucceſs. In addreſſing the Engliſh Catholics on the ſubject of his tranſlation, he has theſe memorable words: "At any rate, I do what I think it my duty to do, and do it fairly and openly. In the following pages ye will find neither palliation nor diſguiſe. I pour out my ſentiments with the ſame ſincerity as if I were before the tribunal of Him who is to judge the living and the dead. Miſtake I may, but prevaricate I never will." He diſcovered this noble ſpirit in every action of his life, and in all his tranſactions and intercourſe with mankind, although he did not conciliate the regard of thoſe who could have beſtowed upon him the moſt effectual aſſiſtance.

After ſpending much of his life in biblical ſtudies, he met with a long and cruel interruption, of which he thus ſpeaks: "I had but little hope of ever living in a ſituation to reſume them, when Providence threw me into the arms of ſuch a patron as Origen himſelf might have been proud to boaſt of—a patron, who, for theſe ten years paſt, has, with a dignity peculiar to himſelf, afforded me every convenience that my heart could deſire towards the carrying on and completing of my arduous work."

It is needleſs to inform the public, that the patron to whom the learned doctor here alludes was Lord Petre. For this munificence continued through the whole of his life, and even beyond it by his latter will, Chriſtians of every denomination will feel ſentiments of gratitude, when they are qualified to make a true eſtimate of the advantages of free and impartial enquiry.

In the year 1792, the firſt volume of his tranſlation Geddes. was publiſhed, dedicated to his patron Lord Petre, containing the firſt ſix books of the Old Teſtament. Soon after this volume made its appearance, three apoſtolic vicars, calling themſelves the biſhops of Rama, Acanthos, and Centuriæ, iſſued a paſtoral letter, addreſſed to their reſpective flocks over which they preſided, warning them againſt the reception of Dr Geddes's tranſlation. In his reply to the biſhop of Centuriæ we find theſe words: "Perhaps, my lord, you wiſh to have another occaſion of exerciſing your epiſcopal authority, and of playing with cenſures as children do with a new ball.—I wiſh your lordſhip much joy of the bauble; but however, my lord, beware of playing too often with it. Read St Chryſoſtom on Eccleſiaſtical Cenſures, and learn from him a little more moderation. Permit an old prieſt to tell you, that it is a very great ornament in a *young biſhop*. As to myſelf, my lord, I am not afraid of your threats, and ſhall laugh at your cenſures as long as I am conſcious that I deſerve them not.—You cannot hinder me from praying at home; and at home I will pray, in defiance of your cenſure, as often as I pleaſe. The chief Biſhop of our ſouls is always acceſſible; and through him I can, at all times, have free acceſs to the Father, who will not reject me, but for voluntary unrepented crimes. In the panoply of conſcious innocence, the whole thunder of the Vatican would in vain be levelled at my head."

The ſecond volume of his tranſlation, owing to a variety of interruptions, did not make its appearance till the year 1797, to which was prefixed a dedication to her royal highneſs the ducheſs of Glouceſter, as an "early, ſpontaneous, and liberal encourager of the work." In this volume the doctor gives up, and boldly combats, the abſolute inſpiration of ſcripture, believing that the Hebrew, like all other hiſtorians, wrote from ſuch human documents as they could find, and were of conſequence liable to ſimilar miſtakes. This latitude of thinking naturally led the doctor to give up as fabulous, and wholly unworthy of the divine philanthropy, every command, precept, and injunction, which appeared unworthy even of human authority. He denied of conſequence, that the command given to deſtroy the Canaanites could have God for its author. This volume of Critical Remarks was publiſhed in 1800, in which he enters into an able vindication of his own theory, which rather increaſed than diminiſhed the number of enemies, for as he wrote to pleaſe no party, he foreſaw that he would have enemies in every party, and ſo it happened.

Dr Geddes was a man of extenſive literature, uncommon liberality of thinking, the friend of all mankind; a man of integrity, honour, and benevolence; in the ſtricteſt ſenſe of the word, a truly genuine Catholic, and whoſe love of truth was ſo invincible, that neither hopes nor fears could induce him to conceal it.

His proſpectus of a new tranſlation of the Bible in 4to was publiſhed in 1786, and a letter to the biſhop of London on the ſame ſubject in 1787. His propoſals were printed in 1788. As a controverſial writer, Dr Geddes was eminently diſtinguiſhed by his letter to Dr Prieſtley, in defence of the divinity of Jeſus Chriſt, and by one to a member of parliament, on the expediency of a general repeal of the penal ſta-

tutes

Geddes, Gehenna.

tutes which have a reſpect to religious opinions. In the ſpring of the year 1800, he publiſhed an apology for the Roman Catholics of Great Britain, in which he zealouſly defended his peculiar tenets, but diſplayed a commendable moderation, when he mentioned the injuries to which he himſelf and brethren were ſubjected by the continuance of perſecuting laws; and, when he argued in behalf of aboliſhing all legal diſabilities, he diſcovered the ſoundeſt logical underſtanding.

We ſhall cloſe our ſhort account of this great man in the words of one who was well acquainted with him, and fully qualified to appreciate his merits. "It muſt be lamented, that, in the death of Dr Geddes, the world has loſt the ſervices of a man, who by his acute and penetrating genuis—his various, profound, and extenſive erudition—his deep reſearch—his indefatigable application—and his independent, dignified, and unfettered ſpirit, riſing ſuperior to the prejudices of education; nobly diſdaining the ſhackles of ſyſtem; ſpurning the petty temporizing arts of unmanly accommodation; and ſetting at defiance all the terrors of malignity, bigotry, and intolerance, was ſupereminently qualified for the great, laborious, and important work in which he had, for a long ſeries of years, been engaged, of giving an Engliſh verſion of the venerable literary remains of ſacred antiquity, the ſcriptures of the Old and New Teſtament. During his life, this work did not meet with encouragement adequate to the magnitude of the deſign; or, it may be added, to the merit of the execution. In this laſt reſpect, it will be matter of ſurpriſe to all who are competent to judge of the nature of ſuch an enterpriſe, how much has been done, and with what uncommon ability and ſucceſs. It everywhere diſplays the ſkilful hand of a maſter."

He had corrected and prepared his tranſlation for the preſs up to the hundredth and eighteenth pſalm, when he was ſeized with a moſt painful and excruciating diſtemper, which put a period to his ineſtimable life on the 26th of February 1802. The learned world will unqueſtionably have cauſe to lament, that Dr Geddes was arreſted by the hand of death in the midſt of his career, unleſs that unexpected phenomenon, another Geddes, ſhould make his appearance, and happily finiſh what his extraordinary predeceſſor conducted ſo far with ſuch aſtoniſhing abilities;—but *rara avis in terris*.

GEHENNA, a ſcripture term which has given ſome pain to the critics. It occurs in St Matthew, v. 22. 29. 30. x. 28. xviii. 9. xxiii. 15. 33. Mark ix. 43. 45. 47. Luke xii. 5. James iii. 6.

The authors of the Louvain and Geneva verſions retain the word *gehenna* as it ſtands in the Greek; the like does M. Simon: the Engliſh tranſlators render it by *hell* and *hell fire*, and ſo do the tranſlators of Mons and Father Bohours.

The word is formed from the Hebrew *gehinnom*, i. e. "valley of Hinnom." In that valley, which was near Jeruſalem, there was a place named *Tophet*, where ſome Jews ſacrificed their children to Moloch, by making them paſs through the fire. King Joſias, to render this place for ever abominable, made a cloaca or common ſewer thereof, where all the filth and carcaſes in the city were caſt.

The Jews obſerved farther, that there was a continual fire kept up there, to burn and conſume thoſe carcaſes; for which reaſon, as they had no proper term in their language to ſignify *hell*, they made uſe of that of *gehenna* or *gehinnom*, to denote a fire unextinguiſhable.

Gehenna || Gellert.

GELA, in *Ancient Geography*, a city of great extent on the ſouth of Sicily, taking its name from the river Gelas, which waſhes it. It was built by coloniſts from Rhodes and Crete, 45 years after the building of Syracuſe, or in the third year of the 22d Olympiad, 690 before Chriſt; originally called *Lindii*, from the coloniſts of *Lindus*, a city of Rhodes, who ſettled there firſt. Now *Terra Nuova*, and the river called *Fiume di Terra Nuova*. The people were called *Geloi*, *Gelenſes*, and *Gelani*. The city of Gela, after having ſtood 408 years, was deſtroyed by Phintias, tyrant of Agrigentum; and the inhabitants were removed to a new city, called *Phintias* after his name.

GELATINA, Jelly. See Jelly.

GELATINOUS, among the phyſicians, is applied to any thing approaching to the glutinous conſiſtence of a jelly.

GELD, in the Engliſh old cuſtoms, a Saxon word ſignifying *money*, or *tribute*. It alſo denoted a compenſation for ſome crimes committed: Hence *wergeld*, in their ancient laws, was uſed for the value of a man ſlain; and *orfgeld*, of a beaſt.

GELDENHAUR, Gerard, in Latin *Geldenharius*, an hiſtorian and Proteſtant divine in the 16th century. He was a native of Nimeguen, and ſtudied claſſical learning at Deventer. He went through his courſe of philoſophy at Louvain, where he contracted a very ſtrict friendſhip with ſeveral learned men, and particularly with Eraſmus. He became reader and hiſtorian to Charles of Auſtria, and afterwards to Maximilian of Burgundy. At length he embraced the Proteſtant religion; taught hiſtory at Marpurg, and afterwards divinity till his death, in 1542. He wrote, 1. Hiſtory of Holland. 2. Hiſtory of Low Countries. 3. Hiſtory of the biſhops of Utrecht; and other works.

GELDERLAND See Guelderland.

GELDERS. See Guelders.

GELDING, the operation of caſtrating any animal. See Castration, Farriery *Index*.

GELE'E, Claude. See Claude.

GELENHAUSEN, a ſmall imperial town of Wetteravia in Germany, with a caſtle built by the emperor Frederic I. E. Long. 8. 13. N. Lat. 50. 20.

GELLENIUS, Sigismund, a learned and excellent man, born of a good family at Prague, about the year 1498. Eraſmus conceiving an eſteem for him at Baſil, recommended him to John Frobenius as a corrector for his printing-houſe; which laborious charge he accepted, and had a great number of Hebrew, Greek, and Latin books to correct: he alſo tranſlated many works himſelf from the Greek and Latin; and publiſhed a dictionary in four languages, Greek, Latin, German, and Sclavonian. Profitable and honourable employments were offered him in other places; but nothing could tempt him to quit his peaceful ſituation at Baſil. He died in 1555. All his tranſlations are highly eſteemed.

GELINOTTE, or Grus. See Tetrao, Ornithology *Index*.

GELLERT, Christian Furchtegolt, was born at Haynichen, in July 1715, near Freyberg, where his

Gellert, Gelli.

his father was a clergyman. He was extraordinary profeſſor of philoſophy at Leipſic, and a diſtinguiſhed writer among the Germans. When but 13 years of age he diſcovered a poetical genius; but having none to guide his taſte for this kind of compoſition, he was led to imitate Gunther, Neukerch, and Hanke, men of indifferent abilities. He ſtudied theology at Leipſic in 1734, and returned home at the expiration of four years, when he commenced public ſpeaker; but his timid diſpoſition prevented him from ſhining as an orator in the pulpit. The delicacy of his conſtitution forbidding him to aſpire after extenſive learning, he confined himſelf to the acquiſition of that which might render him uſeful. He was much reſpected for his firſt attempts in poetry, called Amuſements of Reaſon and Wit, which appeared in 1742.

The labour which he found requiſite for the compoſition of ſermons, inclined him to lay aſide the clerical profeſſion, and devote himſelf wholly to the inſtruction of youth, in which he not only diffuſed knowledge through the minds of his pupils, but alſo inſpired them with the love of religion and virtue. He was made A. M. in 1744, and publiſhed the firſt volume of his fables in the enſuing year. His "Swediſh Counteſs" was the firſt German romance deſerving of notice. He gave the world the ſecond part of his fables in 1748, although two years before this period he was much afflicted with hypochondriacal affections. In 1751, he was ſolicited to accept the office of extraordinary profeſſor of philoſophy, together with a decent ſalary, which was augmented on the termination of the war.

Aſſailed by unconquerable lowneſs of ſpirits and confirmed melancholy, he ſtill exhibited the ſame patience, reſignation, and univerſal philanthropy as he had ever ſhewn, and which excited the admiration of the enemy during the war. His ſufferings continued to increaſe in ſeverity, and at laſt terminated his exiſtence on the 13th of December 1769. He contributed much to the improvement of the taſte and morals of his countrymen, and their gratitude for his ſervices made them deeply lament his loſs. His praiſe was reſounded by every voice, his likeneſs was caſt in gypſum, and moulded in wax; it was engraved on copper, and repreſented in ſculpture and painting.

It is ſaid of this amiable man and captivating writer, by Kutner, who wrote the lives of German authors, that it will probably be a century before the appearance of another poet, ſo fully qualified to excite the love and admiration of his cotemporaries, and obtain ſuch a powerful influence over the taſte and way of thinking of all deſcriptions of men. If it would indicate too much partiality to call him a genius of the firſt claſs, he certainly was a moſt agreeable and fertile writer; the poet to whom religion and virtue are deeply indebted; an able reformer of public manners, and fonder of affording conſolation, than of plunging into deſpondency. Kutner gives him a moſt excellent and enviable character, in theſe words: "As long as the Germans ſhall underſtand their preſent language, will the works of Gellert be read; and his character will be honoured while virtue is known and reſpected."

GELLI, John Baptist, an eminent Italian writer, was born of mean parents at Florence, in the year 1498. He was bred a taylor, ſome ſay a ſhoemaker; but had ſuch an extraordinary genius, that he acquired ſeveral languages, and made an uncommon progreſs in the belles lettres: and though he continued always to work at his trade, became acquainted with all the wits and learned men at Florence, and his merit was univerſally known. He was choſen a member of the academy there, and the city made him a burgeſs. He acquired the higheſt reputation by his works, which are, 1. *I. Caprici del Bottaio*, quarto; which contains ten dialogues. 2. *La Circe*, octavo. This, which alſo contains ten dialogues, and treats of human nature, has been tranſlated into Latin, French, and Engliſh. 3. Diſſertations in Italian on the poems of Dante and Petrarch. 4. The comedies of *La Sporta* and *La Errore;* and other works. He died in 1563.

Gelli || Gem.

GELLIBRAND, Henry, a laborious aſtronomer of the 17th century, was born in 1597. Though he was not without good views in the church, yet he became ſo enamoured with mathematical ſtudies, that on the death of his father he became a ſtudent at Oxford, contented himſelf with his private patrimony, and devoted himſelf ſolely to them. On the death of Mr Gunter, he was recommended by Mr Briggs to the truſtees of Greſham college, for the aſtronomical profeſſorſhip there; to which he was elected in 1627. His friend Mr Briggs dying in 1630, before he had finiſhed his *Trigonometria Britannica*, it was finiſhed by Gellibrand at his requeſt. He wrote ſeveral other things, chiefly tending to the improvement of navigation; and died in 1636.

GELLIUS, Aulus, a celebrated grammarian who lived in the 2d century under Marcus Aurelius and ſome ſucceeding emperors. He wrote a collection of obſervations on authors, for the uſe of his children; and called it *Noctes Atticæ*, becauſe compoſed in the evenings of a winter he ſpent at Athens. The chief value of it is for preſerving many facts and monuments of antiquity not to be found elſewhere. Critics and grammarians have beſtowed much pains on this writer.

GELLY. See Jelly.

GELO, or Gelon, a ſon of Dinomenes who made himſelf abſolute at Syracuſe 484 years before the Chriſtian era. He conquered the Carthaginians at Himera, and made his oppreſſion popular by his great equity and moderation. He reigned ſeven years, and his death was univerſally lamented at Syracuſe. He was called the father of his people, and the patron of liberty, and honoured as a demigod. His brother Hiero ſucceeded him. See Syracuse.

GEM, in *Natural Hiſtory*, a common name for all precious ſtones; of which there are two claſſes, the pellucid and ſemipellucid.

The bodies compoſing the claſs of pellucid gems are bright, elegant, and beautiful foſſils, which are found in ſmall detached maſſes, extremely hard, and of great luſtre.

The bodies compoſing the claſs of ſemipellucid gems, are ſtones naturally compound, not inflammable or ſoluble in water, found in detached maſſes, and compoſed of cryſtalline matter debaſed by earth: however, they are but ſlightly debaſed; and are of great beauty and brightneſs, of a moderate degree of tranſparency, and are uſually found in ſmall maſſes.

The knowledge of gems depends principally on obſerving their hardneſs and colour. Their hardneſs is commonly

Gem. commonly allowed to ſtand in the following order: The diamond the hardeſt of all; then the ruby, ſapphire, jacinth, emerald, amethyſt, garnet, carneol, chalcedony, onyx, jaſper, agate, porphyry, and marble. This difference, however, is not regular and conſtant, but frequently varies. Good cryſtals may be allowed to ſucceed the onyx; but the whole family of metallic glaſſy fluors ſeems to be ſtill ſofter.—In point of colour, the diamond is valued for its tranſparency, the ruby for its purple, the ſapphire for its blue, the emerald for its green, the jacinth for its orange, the amethyſt carneol for its carnation, the onyx for its tawney, the jaſper, agate, and porphyry, for their vermilion, green, and variegated colours, and the garnet for its tranſparent blood red.

All theſe gems are ſometimes found coloured and ſpotted, and ſometimes quite limpid and colourleſs. In this caſe the diamond cutter or poliſher knows how to diſtinguiſh their different ſpecies by their different degrees of hardneſs upon the mill. For the cutting or poliſhing of gems, the fine powder of the fragments of thoſe that are next in degree of hardneſs is always required to grind away the ſofter; but as none of them are harder than the diamond, this can only be poliſhed by its own powder.

Cronſtedt obſerves of gems in general, that the colour of the ruby and emerald are ſaid to remain in the fire, while that of the topaz flies off: hence it is uſual to burn the topaz, and thence ſubſtitute it for the diamond. "Their colours (ſays our author) are commonly ſuppoſed to depend upon metallic vapours; but may they not more juſtly be ſuppoſed to ariſe from a phlogiſton united with a metallic or ſome other earth? becauſe we find that metallic earths which are perfectly well calcined give no colour to any glaſs: and that the manganeſe, on the other hand, gives more colour than can be aſcribed to the ſmall quantity of metal which is to be extracted from it." M. Magellan is of opinion, that their colour is owing chiefly to the mixture of iron which enters their compoſition; but approves the ſentiment of Cronſtedt, that phlogiſton has a ſhare in their production, it being well known that the calces of iron when dephlogiſticated produce the red and yellow colours of marble, and when phlogiſticated to a certain degree produce the blue or green colours.

With regard to the texture of gems, M. Magellan obſerves, that all of them are foliated or laminated, and of various degrees of hardneſs. Whenever the edges of theſe laminæ are ſenſible to the eye, they have a fibrous appearance, and reflect various ſhades of colour, which change ſucceſſively according to their angular poſition to the eye. Theſe are called by the French *chatoyantes;* and what is a blemiſh in their tranſparency, often enhances their value on account of their ſcarcity. But when the ſubſtance of a gem is compoſed of a broken texture, conſiſting of various ſets of laminæ differently inclined to each other, it emits at the ſame time various irradiations of different colours, which ſucceed one another according to their angle of poſition. This kind of gems has obtained the name of *opals*, and are valued in proportion to the brilliancy, beauty, and variety of their colours. Their cryſtallization, no doubt, depends on the ſame cauſe which produces that of ſalts, earths, and metals, which is treated of under the article CRYSTALLIZATION. The following table ſhows the component parts of gems according to the analyſis of Bergman and M. Achard; the letter B prefixed to each denoting Bergman's analyſis, and A that of Achard. Gem.

		Argil.	Silic.	Calc.	Iron.
Red oriental ruby,	B	40	39	9	10
Ditto,	A	37.5	42.5	9	11
Blue oriental ſapphire,	B	58	35	5	2
Ditto,	A	58	33	6	3
Yellow topaz from Saxony,	B	46	39	8	6
Green oriental emerald,	B	60	24	8	6
Ditto,	A	60	23	10	7
Yellow brown orient. hyacinth,	B	40	25	20	13
Ditto,	A	42	22	20	16
Tourmalin from Ceylon,	B	39	37	15	9
Ditto from Braſil,	B	50	34	11	5
Ditto from Tyrol,	B	42	40	12	6
Garnet from Bohemia,	A	30	48	11	10

But later analyſes ſhew that the component parts are different from the above, particularly the coluring matters which are here aſcribed to iron. See MINERALOGY.

The chryſopraſe from Koſeinitz in Sileſia was likewiſe analyzed by M. Achard; who found that it contained 456 grains of ſiliceous earth, 13 of calcareous, ſix of magneſia, three of copper, and two of iron. "This (ſays M. Magellan) ſeems to be the only gem that contains no argillaceous earth."

Imitation or Counterfeiting of GEMS *in Glaſs.* The art of imitating gems in glaſs is too conſiderable to be paſſed without notice: ſome of the leading compoſitions therein we ſhall mention upon the authority of Neri and others.

Theſe gems are made of paſtes; and are noway inferior to the native ſtones, when carefully made and well poliſhed, in brightneſs or tranſparence, but want their hardneſs.

The general rules to be obſerved in making the paſtes are theſe: 1. That all the veſſels in which they are made be firmly luted, and the lute left to dry before they are put into the fire. 2. That ſuch veſſels be choſen for the work as will bear the fire well. 3. That the powders be prepared on a porphyry ſtone; not in a metal mortar, which would communicate a tinge to them. 4. That the juſt proportion in the quantity of the ſeveral ingredients be nicely obſerved. 5. That the materials be all well mixed; and, if not ſufficiently baked the firſt time, to be committed to the fire again, without breaking the pot; for if this be not obſerved, they will be full of bliſters and air bladders. 6. That a ſmall vacuity be always left at the top of the pot, to give room to the ſwelling of the ingredients.

To make paſte of extreme hardneſs, and capable of all the colours of the gems, with great luſtre and beauty.—Take of prepared cryſtal, ten pounds; ſalt of polverine, ſix pounds; ſulphur of lead, two pounds: mix all theſe well together into a fine powder; make the whole with common water into a hard paſte; and make this paſte into ſmall cakes of about three ounces weight each, with a hole made in their middle; dry them in the ſun, and afterwards calcine them in the ſtraiteſt part of a potter's furnace. After this, pow-

der

Gem. der them, and levigate them to a perfect fineneſs on a porphyry ſtone, and ſet this powder in pots in a glaſs furnace to purify for three days: then caſt the whole into water, and afterwards return it into the furnace, where let it ſtand 15 days, in which time all foulneſs and blitters will diſappear, and the paſte will greatly reſemble the natural jewels. To give this the colour of the emerald, add to it braſs thrice calcined; for a ſea green, braſs ſimply calcined to a redneſs; for a ſapphire, add zaffer, with manganeſe; and for a topaz, manganeſe and tartar. All the gems are thus imitated in this, by the ſame way of working as the making of coloured glaſſes; and this is ſo hard, that they very much approach the natural gems.

The colour of all the counterfeit gems made of the ſeveral paſtes, may be made deeper or lighter according to the work for which the ſtones are deſigned; and it is a neceſſary general rule, that ſmall ſtones for rings, &c. require a deeper colour, and large ones a paler. Beſides the colours made from manganeſe, verdigris, and zaffer, which are the ingredients commonly uſed, there are other very fine ones which care and ſkill may prepare. Very fine red may be made from gold, and one not much inferior to that from iron; a very fine green from braſs or copper; a ſky colour from ſilver, and a much finer one from the granates of Bohemia.

A very ſingular and excellent way of making the paſte to imitate the coloured gems is this: Take a quantity of ſaccharum ſaturni, or ſugar of lead, made with vinegar in the common way; ſet it in ſand, in a glaſs body well luted from the neck downwards; leave the mouth of the glaſs open, and continue the fire 24 hours; then take out the ſalt, and if it be not red but yellowiſh, powder it fine, and return it into the veſſel, and keep it in the ſand heat 24 hours more, till it becomes as red as cinnabar. The fire muſt not be made ſo ſtrong as to melt it, for then all the proceſs is ſpoiled. Pour diſtilled vinegar on this calcined ſalt, and ſeparate the ſolution from the dregs; let the decanted liquor ſtand ſix days in an earthen veſſel, to give time for the finer ſediment to ſubſide; filter this liquor, and evaporate it in a glaſs body, and there will remain a moſt-pure ſalt of lead; dry this well, then diſſolve it in fair water; let the ſolution ſtand ſix days in a glazed pan; let it ſubſide, then filter the clear ſolution, and evaporate it to a yet more pure white and ſweet ſalt; repeat this operation three times; put the now perfectly pure ſalt into a glaſs veſſel, ſet it in a ſand heat for ſeveral days, and it will be calcined to a fine impalpable powder of a lively red. This is called *the ſulphur of lead.*

Take all the ingredients as in the common compoſition of the paſtes of the ſeveral colours, only inſtead of red lead, uſe this powder; and the produce will well reward the trouble of the operation, as experience has often proved.

A paſte proper for receiving colours may be readily made by well pounding and mixing ſix pounds of white ſand cleanſed, three pounds of red lead, two pounds of purified pearl aſhes, and one pound of nitre. A ſofter paſte may be made in the ſame manner, of ſix pounds of white ſand cleanſed; red lead, and purified pearl-aſhes, of each three pounds; one pound of nitre, half a pound of borax, and three ounces of arſenic. For common uſe a pound of common ſalt may be ſubſtituted for the borax. This glaſs will be very ſoft, and will not bear much wear if employed for rings, buckles, or ſuch imitations of ſtones as are expoſed to much rubbing; but for ear-rings, ornaments worn on the breaſt, and thoſe little uſed, it may laſt a conſiderable time. Gem.

In order to give paſte different colours, the proceſs is as follows: For

Amethyſt. Take ten pounds of either of the compoſitions deſcribed under *Colouring of* GLASS, one ounce and a half of manganeſe, and one drachm of zaffer; powder and fuſe them together.

Black. Take ten pounds of either of the compoſitions juſt referred to, one ounce of zaffer, ſix drachms of manganeſe, and five drachms of iron, highly calcined; and proceed as before.

Blue. Take of the ſame compoſition, ten pounds; of zaffer, ſix drachms; and of manganeſe, two drachms: and proceed as with the foregoing.

Chryſolite. Take of either of the compoſitions for paſte above deſcribed, prepared without ſaltpetre, ten pounds. and of calcined iron five drachms; and purſue the ſame proceſs as with the reſt.

Red Cornelian. Take of the compoſitions mentioned under *Colouring of* GLASS, two pounds; of glaſs of antimony, one pound; of the calcined vitriol called *ſcarlet ochre*, two ounces; and of manganeſe, one drachm. Fuſe the glaſs of antimony and manganeſe with the compoſition; then powder them, and mix them with the other, by grinding them together, and fuſe them with a gentle heat.

White Cornelian. Take of the compoſition juſt referred to, two pounds; of yellow ochre well waſhed, two drachms; and of calcined bones, one ounce. Mix them, and fuſe them with a gentle heat.

Diamond. Take of the white ſand, ſix pounds; of red lead, four pounds; of pearl aſhes, purified, three pounds; of nitre two pounds; of arſenic five ounces; and of manganeſe, one ſcruple. Powder and fuſe them.

Aigue-marine. Take ten pounds of the compoſition under GLASS; three ounces of copper highly calcined with ſulphur; and one ſcruple of zaffer. Proceed as before.

Emerald. Take of the ſame compoſition with the laſt, nine pounds; three ounces of copper precipitated from aquafortis; and two drachms of precipitated iron. See EMERALD, MINERALOGY *Index.*

Garnet Take two pounds of the compoſition under GLASS; two pounds of the glaſs of antimony, and two drachms of manganeſe. For vinegar garnet, take of the compoſition for paſte. deſcribed in this article, two pounds; one pound of glaſs of antimony, and half an ounce of iron, highly calcined: mix the iron with the uncoloured paſte, and fuſe them: then add the glaſs of antimony powdered, and continue them in the heat till the whole is incorporated.

Gold or *full Yellow.* Take of the compoſition for paſte ten pounds; and one ounce and a half of iron ſtrongly calcined; proceeding as with the others.

Deep Purple. Take of either of the compoſitions for paſte, ten pounds; of manganeſe, one ounce; and of zaffer, half an ounce.

Ruby. Take one pound of either of the compoſitions

Gem. tions for paſte, and two drachms precipitate of gold by tin; powder the paſte, and grind the calx of gold with it in a glaſs, flint, or agate mortar, and then fuſe them together. A cheaper ruby paſte may be made with half a pound of either of the above compoſitions, half a pound of glaſs of antimony, and one drachm and a half of the calx of gold; proceeding as before.

Sapphire. Take of the compoſition for paſte, ten pounds; of zaffer, three drachms and one ſcruple; and of the *calx Caſſii*, one drachm. Powder and fuſe them. Or the ſame may be done, by mixing with the paſte one-eighth of its weight of ſmalt.

Topaz. Take of the compoſitions under GLASS ten pounds, omitting the ſaltpetre; and an equal quantity of the *Gold-coloured hard GLASS.* Powder and fuſe them. See TOPAZ, MINERALOGY *Index.*

Turquoiſe. Take of the compoſition for blue paſte already deſcribed, ten pounds; of calcined bone, horn, or ivory, half a pound. Powder and fuſe them.

Opaque white. Take of the compoſition for paſte ten pounds; and one pound of calcined horn, ivory, or bone; and proceed as before.

Semitranſparent white, like opal. See OPAL, MINERALOGY *Index.*

To the above we ſhall add the following receipts and proceſſes, contained in a memoir by M. Fontanieu of the Royal Academy of Sciences at Paris, and ſaid to have met with much approbation.

I. *Of the Baſes.* Although the different calces of lead are all adapted to produce the ſame effect in vitrification; yet M. Fontanieu prefers lead in ſcales, and next to that minium, as being the moſt conſtantly pure. It is neceſſary to ſift through a ſilk ſieve the preparations of lead one wiſhes to make uſe of in the vitrification, in order to ſeparate the groſſer parts, as alſo the lead found in a metallic ſtate when white lead in ſcales is employed.

The baſe of factitious gems is calx of lead and rock cryſtal, or any other ſtone vitrifiable by the calces already mentioned. Pure ſand, flint, and the tranſparent pebbles of rivers, are ſubſtances equally fit to make glaſs: but as it is firſt neceſſary to break the maſſes of cryſtal, ſtones, or pebbles, into ſmaller parts; ſo by this operation particles of iron or copper are frequently introduced, and to theſe duſt or greaſy matters are alſo apt to adhere. Our author therefore begins by putting the pounded cryſtal or pebbles into a crucible, which he places in a degree of heat capable of making the maſs red hot; he then pours it into a wooden bowl filled with very clear water; and ſhaking the bowl from time to time, the ſmall portions of coals furniſhed by the extraneous bodies ſwim on the ſurface of the water, and the vitrifiable earth, with the iron, &c. reſts on the bottom. He then decants the water; and having dried the maſs, he pounds it, and ſifts the powder through the fineſt ſilk ſieve: he then digeſts the powder during four or five hours with marine acid, ſhaking the mixture every hour. After having decanted the marine acid from the vitrifiable earth, he waſhes the latter until the water no longer reddens the tincture of turnſol. The ſaid earth being dried, is paſſed through a ſilk ſieve, and is then fit for uſe. Nitre, ſalt of tartar, and borax, are the three ſpecies of ſalts that enter with quartz and the ſeveral calces of lead into M. Fontanieu's vitrifications.

Much of the ſucceſs in the art of making coloured ſtones depends on the accurate proportion of the ſubſtances made uſe of to form the cryſtal which ſerves as a baſe to the factitious ſtones. After having tried a great variety of receipts, our author found they might be reduced to the following. Gem.

1. Take two parts and a half of lead in ſcales, one part and a half of rock cryſtal or prepared flints, half a part of nitre, as much borax, and a quarter part of glaſs of arſenic. Theſe being well pulverized and mixed together, are to be put into a Heſſian crucible, and ſubmitted to the fire. When the mixture is well melted, pour it into cold water: then melt it again a ſecond and a third time; taking care, after each melting, to throw it into freſh cold water, and to ſeparate from it the lead that may be revived. The ſame crucible ſhould not be uſed a ſecond time, becauſe the glaſs of lead is apt to penetrate it in ſuch a manner as to run the riſk of loſing the contents. One muſt alſo be careful to cover the crucible well, to prevent any coals getting into it, which would reduce the calx of lead, and ſpoil the compoſition.

2. Take two parts and a half of white ceruſe, one part of prepared flints, half a part of ſalt of tartar, and a quarter part of calcined borax: melt the mixture in a Heſſian crucible, and then pour it into cold water; it is then to be melted again, and waſhed a ſecond and a third time, the ſame precautions being obſerved as for the firſt baſe.

3. Take two parts minium, one part rock cryſtal, half a part of nitre, and as much ſalt of tartar: this mixture being melted, muſt be treated as the former.

4. Take three parts of calcined borax, one part of prepared rock cryſtal, and one part of ſalt of tartar; theſe being well mixed and melted together, muſt be poured into warm water: the water being decanted and the maſs dried, an equal quantity of minium muſt be added to it; it is then to be melted and waſhed ſeveral times as directed above.

5. That called by our author the *Mayence baſe*, and which he conſiders as one of the fineſt cryſtalline compoſitions hitherto known, is thus compoſed: Take three parts of fixed alkali of tartar, one part of rock cryſtal or flint pulverized: the mixture to be well baked together, and then left to cool. It is afterwards poured into a crucible of hot water to diſſolve the frit; the ſolution of the frit is then received into a ſtone-ware pan, and aquafortis added gradually to the ſolution till it no longer effervеſces: this water being decanted, the frit muſt be waſhed in warm water till it has no longer any taſte: the frit is then dried, and mixed with one part and a half of fine ceruſe or white lead in ſcales; and this mixture muſt be well levigated with a little diſtilled water. To one part and a half of this powder dried add an ounce of calcined borax: let the whole be well mixed in a marble mortar, then melted and poured into cold water as the other baſes already deſcribed. Theſe fuſions and lotions having been repeated, and the mixture dried and powdered, a 12th part of nitre muſt be added to it, and then melted for the laſt time; when a very fine cryſtal will be found in the crucible.

6. As a compoſition for furniſhing very fine white ſtones: Take eight ounces of ceruſe, three ounces of

Gem. rock cryſtal pulverized, two ounces of borax finely powdered, and half a grain of manganeſe: having melted and waſhed this mixture in the manner directed above, it will produce a very fine white cryſtal.

II. *Of the Colours.* The calces of metals, as already obſerved, are the ſubſtances employed to colour factitious gems; and on the preparation of theſe calces depends the vividneſs of their colours.

a, From *Gold.*] To obtain the mineral purple known by the name of *precipitate of Caſſius*, M. Fontanieu employs the following different proceſſes.

1. Diſſolve ſome pure gold in aqua regia, prepared with three parts of precipitated nitrous acid and one part of marine acid; and to haſten the diſſolution, the matraſs ſhould be placed in a ſand bath. Into this ſolution pour a ſolution of tin in aqua regia. The mixture becomes turbid, and the gold is precipitated with a portion of the tin, in the form of a reddiſh powder; which after being waſhed and dried, is called *precipitate of Caſſius.*—The aqua regia employed to diſſolve the tin is compoſed of five parts of nitrous acid and one part of marine acid: to eight ounces of this aqua regia, are added ſixteen ounces of diſtilled water. Some leaves of Malacca tin, about the ſize and thickneſs of a ſixpence, are then put into this diluted aqua regia, till it will diſſolve no more of them: which operation our author obſerves, requires commonly twelve or fourteen days; though it might probably be haſtened by beating the tin ſtill thinner, and then rolling it into the form of a hollow cylinder, or turning it round into ſpiral convolutions, and thus expoſing a greater extent of ſurface to the action of the menſtruum. In order to prepare more readily the precipitate of Caſſius, M. Fontanieu puts into a large jug eight ounces of ſolution of tin, to which he adds four pints of diſtilled water: he afterwards pours into this metallic lye ſome ſolution of gold, drop by drop, taking care to ſtir the whole with a glaſs tube: when the mixture becomes of a deep purple colour, he ceaſes dropping the ſolution of gold; and in order to haſten the precipitation of the mineral purple, pours into the mixture a pint of freſh urine. Six or ſeven hours after, the precipitate is collected at the bottom of the veſſel: the fluid is then decanted; and the precipitate, waſhed once or twice, is dried till it becomes a brown powder.

2. Pour into a veſſel of fine tin with a thick bottom four ounces of the ſolution of gold; three minutes after add two pints of diſtilled water. Let this mixture ſtand in the tin veſſel during ſeven hours, taking care to ſtir it every hour with a glaſs tube; afterwards pour it into a conical glaſs jug, and add to it a pint of new urine: the mineral purple is ſoon precipitated, and then is to be waſhed and dried.

3. Diſtil in a glaſs retort placed in a bath of aſhes, ſome gold diſſolved in aqua regia, made with three parts nitrous and one part marine acid; when the acid is paſſed over and the gold contained in the retort appears dry, leave the veſſel to cool, then pour into it ſome new aqua regia, and proceed to diſtil as before. Replace the aqua regia twice upon the gold, and diſtil the ſame. After theſe four operations, pour by little and little into the retort ſome oil of tartar *per deliquium*, which will occaſion a briſk effervescence: when this ceaſes, diſtil the mixture till it becomes dry, and then put ſome warm water into the retort. Shake the whole and pour it into a cucurbit, when a precipitate is depoſited, the colour of which is ſometimes brown and ſometimes yellow: After having waſhed this precipitate, dry it. Our author ſays, this mineral purple was much ſuperior to the foregoing, ſince two grains of it only were ſufficient to an ounce of the baſe, whilſt it required of the other two a 20th part of the baſe. And he adds, that he found a means of exalting the colour of the precipitate of Caſſius, by putting to it a ſixth part of its weight of glaſs of antimony finely powdered, and of nitre in the proportion of a drachm to eight ounces of the baſe. Gem.

b, From *Silver.*] The oxide of ſilver, being vitrified, produces a yelloviſh gray colour. This oxide enters only into the compoſition of the yellow artificial diamond and the opal. M. Fontanieu introduces it into the baſe in the form of luna cornea.

In order to prepare it, he directs to diſſolve the ſilver in precipitated nitrous acid, and afterwards to pour into it a ſolution of ſea ſalt: a white precipitate is obtained; which, being waſhed and dried, melts very readily in the fire, and is ſoon volatilized if not mixed with vitrifiable matters. To make the yellow diamond, 25 grains of this luna cornea are put to an ounce of the fourth baſe: the doſe of ſilver may be diminiſhed according to the ſhade of yellow that one wiſhes to procure.

c, From *Copper.*] The oxide of copper imparts to white glaſs the fineſt green colour; but if this metal be not exactly in a ſtate of oxide, it produces a browniſh red colour. *Mountain blue verdigris*, and the reſidue of its diſtillation, are the different preparations of copper which our author employs to make the artificial emeralds.

d, From *Iron.*] Although it has been aſſerted that the oxides of iron introduce a very fine tranſparent red colour into white glaſs, M. Fontanieu could only obtain from it a pale red a little opake. The oxide of iron that he employed was in the proportion of the 20th part of the baſe.

There are ſeveral ways of preparing the oxide of iron called *crocus Martis*, or *ſaffron of Mars.* In general, it is neceſſary that this metal be ſo far oxidated that the magnet ceaſes to attract it: thus one may uſe the ſcales of iron found upon the bars of the furnaces which ſerve to diſtil aquafortis. By digeſting filings of ſteel with diſtilled vinegar, then evaporating and replacing the vinegar 10 or 12 times upon theſe filings and drying them alternately, an oxide of iron is obtained, which muſt be ſifted through a ſilk ſieve, and then calcined. The oxide of iron thus obtained by the vinegar, our author ſays, only introduced into his baſes a green colour inclining to a yellow.

By the following proceſs a ſaffron of Mars of the fineſt red colour is obtained: Let an ounce of iron filings be diſſolved in nitrous acid in a glaſs retort, and diſtilled over a ſand bath to dryneſs. After having replaced the acid or the dry oxide, and re-diſtilled it a ſecond and a third time, it is then edulcorated with ſpirits of wine, and afterwards waſhed with diſtilled water.

e, From the *Magnet.*] It is neceſſary to calcine the magnet before it be introduced into the vitrifications: Having therefore torrefied the magnet during two hours,

Gem. hours, it muſt be waſhed and dried. It is only employed in the compoſition of the opal.

f, From *Cobalt*.] The oxide of cobalt is only proper to introduce a blue colour into glaſs; but this ſemimetal is rarely found free from iron and biſmuth, and therefore it is firſt neceſſary to ſeparate them from it. This is done by calcining the ore of cobalt in order to diſengage the arſenic; afterwards the oxide muſt be diſtilled in a retort with ſal ammoniac, and the iron and the biſmuth are found ſublimed with this ſalt. The diſtillation muſt be repeated with the ſal ammoniac till this ſalt is no longer coloured yellow. The cobalt which remains in the cornute is then calcined in a potſherd, and becomes a very pure oxide; which being introduced into the baſe, in the proportion of a 900dth part, gives it a very fine blue colour, the intenſity of which may be increaſed at diſcretion by the addition of oxide of cobalt. In order to prepare *black enamel* reſembling that which is called *black agate* of Iceland; melt together a pound and a half of one of the baſes, two ounces of the oxide of cobalt, two ounces of *crocus Martis* prepared with vinegar, and two ounces of manganeſe.

g, From *Tin*.] The oxide of tin, which is of a white colour, renders opake the glaſs with which it is melted, and forms white enamel. For this purpoſe, calcine the putty of tin; then waſh and dry it, and ſift it through a ſilk ſieve. Take ſix pounds of the ſecond baſe, the ſame quantity of the calcined putty of tin, and 48 grains of manganeſe.

h, From *Antimony*.] Antimony is only ſuſceptible of vitrification in a certain ſtate of oxidation, and then it produces a reddiſh or hyacinth coloured glaſs; but if the antimony be in a ſtate of abſolute calx, ſuch as the diaphoretic antimony, then it is no longer vitrifiable, and may be ſubſtituted for oxide of tin to make white enamel. M. Fontanieu introduces the glaſs of antimony in the compoſition of artificial topazes. For the *oriental topaz*, he takes 24 ounces of the firſt baſe, and five drachms of the glaſs of antimony. To imitate the *topaz of Saxony*, he adds to each ounce of the baſe five grains of the glaſs of antimony. For the *topaz of Brazil*, he takes 24 ounces of the firſt baſe, one ounce 24 grains of glaſs of antimony, and 8 grains of the *precipitate of Caſſius*.

i, From *Manganeſe*.] This mineral employed in a ſmall quantity, renders the glaſs whiter; a larger quantity produces a very fine violet colour, and a ſtill larger doſe of it renders the glaſs black and opake.

There are two ways of preparing manganeſe. 1. The moſt ſimple conſiſts in expoſing it to a red heat, and then quenching it with diſtilled vinegar; it is afterwards dried and powdered, in order to paſs it through a ſilk ſieve. 2. Haudiquer de Blancour deſcribes the ſecond manner of preparing the manganeſe, proper to furniſh a red colour, and names it *fuſible manganeſe*. Take of manganeſe of Piedmont one pound; torrefy and pulverize it; then mix it with a pound of nitre, and calcine the mixture during 24 hours; afterwards waſh it repeatedly in warm water, till the water of the lyes has no longer any taſte; dry the manganeſe, and mix with it an equal weight of ſal ammoniac; levigate this mixture on a ſlab of porphyry with oil of vitriol diluted with water to the ſtrength of vinegar. Dry the mixture, and introduce it into a cornute; diſtil by a graduated fire; and when the ſal ammoniac is ſublimed weigh it, and add to the mixture an equal quantity. Then diſtil and ſublime as before, and repeat the operation ſix times, being careful at each time to mix the ſal ammoniac and the manganeſe upon the porphyry with diluted oil of vitriol. Gem.

At Tournhault in Bohemia, there is ſold a fuſible glaſs of a yellow colour, very like that of the topaz of Brazil, which, when expoſed to a degree of fire in a cupel ſufficient to redden it, becomes of a very fine ruby colour, more or leſs deep according to the degree of fire to which it has been expoſed. Our author aſſayed this glaſs, and found it to contain a great deal of lead, but was not able to diſcover any gold in it.

III. *Of the different degrees of fire neceſſary for Factitious Gems*. Our author obſerves, that there are three degrees of heat very different in their energy. The fire kept up in the wind furnaces in the laboratories of chemiſts, is leſs active than that whoſe effect is accelerated by the means of bellows; and a fire ſupported by wood, and kept up during 60 hours without interruption, produces ſingular effects in vitrification, and renders the glaſs finer and leſs alterable.

When recourſe is had to the forge, in order to operate a vitrification, it is neceſſary to turn about the crucible from time to time, that the maſs may melt equally. Some coal alſo ſhould be replaced, in proportion as it conſumes towards the nozel of the bellows; for without this precaution, we ſhould run the riſk of cooling the crucible oppoſite to the flame, and probably of cracking it, when all the melted maſs running among the coals would be totally loſt. Though this is the readieſt way of melting, it ſhould not be employed out of choice; for the crucible often breaks, or coals get into it, which may reduce the lead to the metallic ſtate.

The wind furnace is either ſquare or round. A ſmall cake of baked clay or brick, of the thickneſs of an inch, is placed upon the grate; and upon this cake is placed the crucible, ſurrounded with coals. The degree of heat produced by this furnace is much leſs than that of the forge: but in order to ſucceed in the vitrification, M. Fontanieu recommends the uſe of a furnace deſcribed by Kunckel, of which, the interior part is ſo diſpoſed, that we may place crucibles at three different heights; and the name of *chambers* is given to thoſe ſteps upon which the crucibles are placed.

It is obvious, that the degree of heat cannot be equal in the ſaid three chambers. In the firſt or loweſt chamber the heat is greateſt, afterwards in the next, and laſtly, in the higheſt. We ſhould begin by placing the crucibles according to their ſize, in theſe different chambers; by which means the beſt effect in vitrification is produced.

In order to conduct the fire well, only three billets of white wood ſhould be put into the furnace at a time for the firſt 20 hours, four billets at a time for the next 20 hours, and ſix billets for the laſt 20 hours; in all 60 hours. The furnace is then left to cool, care being taken to ſtop the air holes with ſome lute; and in about 48 hours after, when the kiln is quite cold, the crucible is to be withdrawn.

IV. *The Compoſitions*. 1. For the white diamond:

Gem. Take the baſe of Mayence. This cryſtal is very pure, and has no colours.

2. For the yellow diamond: To an ounce of the fourth baſe, add for colour 25 grains of luna cornea or 10 grains of glaſs of antimony.

3. For the emerald: 1. To 15 ounces of either of the baſes, add for colour one drachm of mountain blue and ſix grains of glaſs of antimony; or, 2. To an ounce of the ſecond baſe, add for colour 20 grains of glaſs of antimony and three grains of calx of cobalt.

4. For the ſapphire: To 24 ounces of the Mayence baſe, add for colour two drachms 46 grains of the calx of cobalt.

5. For the amethyſt: To 24 ounces of the Mayence baſe, add for colour four drachms of prepared manganeſe and four grains of precipitate of Caſſius.

6. For the beryl: To 24 ounces of the third baſe, add for colour 96 grains of glaſs of antimony and four grains of calx of cobalt.

7. For the black agate: To 24 ounces of either of the baſes, add two ounces of the mixture directed above in par. *f*.

8. For the opal: To an ounce of the third baſe, add for colour 10 grains of luna cornea, two grains of magnet, and 26 grains of abſorbent earth.

9. For the oriental topaz: To 24 ounces of the firſt or third baſe, add for colour five drachms of glaſs of antimony.

10. For the topaz of Saxony: To 24 of the ſame baſe, add for colour ſix drachms of the glaſs of antimony.

11. For the topaz of Braſil: To 24 ounces of the ſecond or third baſe, add for colour one ounce 24 grains of the glaſs of antimony and eight grains of precipitate of Caſſius.

12. For the hyacinth: To 24 ounces of the baſe made with rock cryſtal, add for colour two drachms 48 grains of glaſs of antimony.

13. For the oriental ruby: 1. To 16 ounces of the Mayence baſe, add for colour a mixture of two drachms 48 grains of the precipitate of Caſſius, the ſame quantity of crocus Martis prepared in aquafortis, the ſame of golden ſulphur of antimony and of fuſible manganeſe, with the addition of two ounces of mineral cryſtal: or, 2. To 20 ounces of the baſe made with flint, add half an ounce of fuſible manganeſe and two ounces of mineral cryſtal.

14. For the balaſs ruby: 1. To 16 ounces of the Mayence baſe, add the above colouring powder, but diminiſhed a fourth part; or, 2. To 20 ounces of the baſe made with flints, add the ſame colouring powder, but with a fourth leſs of the manganeſe.

The *factitious* gems are eaſily diſtinguiſhed from the *natural*, by their ſoftneſs and fuſibility; by their ſolubility in acids; by their cauſing only a ſingle refraction of the rays of light; and in many caſes, by their ſpecific gravity, which exceeds 2.76 in all precious gems of the firſt order, as the diamond, ruby, ſapphire, &c.

Imitation of Antique GEMS. There has been at different times a method practiſed by particular perſons of taking the impreſſions and figures of antique gems, with their engravings, in glaſs of the colour of the original gem. This has always been eſteemed a very valuable method, and greatly preferable to the more ordinary ones of doing it on ſealing wax or brimſtone; but, to the misfortune of the world, this art being a ſecret only in the hands of ſome particular perſons who got their bread by it, died with them, and every new artiſt was obliged to re-invent the method; till at length Mr Homberg having found it in great perfection, gave the whole proceſs to the world to be no more forgotten or loſt; and ſince that time it has been very commonly practiſed in France, and ſometimes in other places. Gem.

Mr Homberg was favoured in his attempts with all the engraved gems of the king's cabinet; and took ſuch elegant impreſſions, and made ſuch exact reſemblances of the originals, and that in glaſſes ſo artfully tinged to the colour of the gems themſelves, that the niceſt judges were deceived in them, and often took them for the true antique ſtones. The counterfeit gems alſo ſerve, as well as the original ones, to make more copies from afterwards; ſo that there is no end of the numbers that may be made from one; and there is this farther advantage, that the copy may be eaſily made perfect, though the original ſhould not be ſo, but ſhould have ſuſtained ſome damage from a blow or otherwiſe.

The great care in the operation is to take the impreſſion of the gem in a very fine earth, and to preſs down upon this a piece of proper glaſs, ſoftened or half melted at the fire, ſo that the figures of the impreſſion made in the earth may be nicely and perfectly expreſſed upon the glaſs. In general, the whole proceſs much reſembles that of the common founders. But when it is brought to the trial, there is found a number of difficulties which were not to be foreſeen, and which would not at all affect the common works of the founder. For this purpoſe, every earth will ſerve that is fine enough to receive the impreſſions, and tough enough not to crack in the drying: theſe all ſerve for their uſe, becauſe the metals which they caſt are of a nature incapable of mixing with earth, or receiving it into them, even if both are melted together, ſo that the metal always eaſily and perfectly ſeparates itſelf from the mould; but it is very difficult in theſe caſts of glaſs. They are compoſed of a matter which differs in nothing from that of the mould, but that it has been run into this form by the force of fire, and the other has not yet been ſo run, but is on any occaſion ready to be ſo run, and will mix itſelf inſeparably with the glaſs in a large fire: conſequently, if there be not great care uſed, as well in the choice of the glaſs as in the manner of uſing it, when the whole is finiſhed there will be found great difficulty in the ſeparating the glaſs from the mould, and often this cannot be done without wholly deſtroying the impreſſion.

All earths run more or leſs eaſily in the fire as they are more or leſs mixed with ſaline particles in their natural formation. As all ſalts make earths run into glaſs, and as it is neceſſary to uſe an earth on this occaſion for the making a mould, it being alſo neceſſary to the perfection of the experiment that this earth ſhould not melt or run, it is our buſineſs to ſearch out for this purpoſe ſome earth which naturally contains very little ſalt. Of all the ſpecies of earth which Mr Homberg examined on this occaſion, none proved ſo much

Gem. much diveſted of ſalts, or ſo fit for the purpoſe, as the common tripela, or TRIPOLI, uſed to poliſh glaſs and ſtones. Of this earth there are two common kinds: the one reddiſh, and compoſed of ſeveral flakes or ſtrata; the other yellowiſh, and of a ſimple ſtructure. Theſe are both to be had in the ſhops. The latter kind is from the Levant; the former is found in England, France, and many other places. The tripela muſt be choſen ſoft and ſmooth to the touch, and not mixed with ſandy or other extraneous matter. The yellowiſh kind is the beſt of the two, and is commonly called *Venetian tripoli*. This receives the impreſſions very beautifully; and never mixes with the glaſs in the operation, which the red kind ſometimes does. Mr Homberg uſually employed both kinds at once in the following manner: firſt powder a quantity of the red tripela in an iron mortar, and ſifting it through a fine ſieve ſet it by for uſe; then ſcrape with a knife, a quantity of the yellow tripela into a ſort of powder, and afterwards rub it till very fine in a glaſs mortar with a glaſs peſtle. The finer this powder is, the finer will be the impreſſion, and the more accurately perfect the caſt. The artificer might naturally ſuppoſe, that the beſt method to obtain a perfect fine powder of this earth would be by waſhing it in water; but he muſt be cautioned againſt this. There is naturally in this yellowiſh tripoli a ſort of unctuoſity, which when it is formed into a mould keeps the granules together, and gives the whole an uniform gloſſy ſurface: now the waſhing the powder takes away this unctuoſity; and though it renders it much finer, it makes it leave a granulated ſurface, not this ſmooth one, in the mould; and this muſt render the ſurface of the caſt leſs ſmooth.

When the two tripelas are thus ſeparately powdered, the red kind muſt be mixed with ſo much water as will bring it to the conſiſtence of paſte, ſo that it may be moulded like a lump of dough between the fingers: this paſte muſt be put into a ſmall crucible of a flat ſhape, and about half an inch or a little more in depth, and of ſuch a breadth at the ſurface as is a little more than that of the ſtone whoſe impreſſion is to be taken. The crucible is to be nicely filled with this paſte lightly preſſed down into it, and the ſurface of the paſte muſt be ſtrewed over with the fine powder of the yellow tripela not wetted. When this is done, the ſtone, of which the impreſſion is to be taken, muſt be laid upon the ſurface, and preſſed evenly down into the paſte with a finger and thumb, ſo as to make it give a ſtrong and perfect impreſſion; the tripela is then to be preſſed nicely even to its ſides with the fingers, or with an ivory knife. The ſtone muſt be thus left a few moments, for the humidity of the paſte to moiſten the dry powder of the yellow tripela which is ſtrewed over it: then the ſtone is to be carefully raiſed by the point of a needle fixed in a handle of wood; and the crucible being then turned bottom upwards, it will fall out, and the impreſſion will remain very beautifully on the tripoli.

If the ſides of the cavity have been injured in the falling out of the ſtone, they may be repaired; and the crucible muſt then be ſet, for the paſte to dry, in a place where it will not be incommoded by the duſt.

The red tripoli being the more common and the cheaper kind, is here made to fill the crucible only to ſave the other, which alone is the ſubſtance fit for taking the impreſſion. When the ſtone is taken out, it muſt be examined, to ſee whether any thing be lodged in any part of the engraving, becauſe if there be any of the tripela left there, there will certainly be ſo much wanting in the impreſſion. When the crucible and paſte are dry, a piece of glaſs muſt be choſen of a proper colour, and cut to a ſize proper for the figure; this muſt be laid over the mould, but in ſuch a manner that it does not touch the figures, otherwiſe it would ſpoil them. The crucible is then to be brought near the furnace by degrees, and gradually heated till it cannot be touched without burning the fingers; then it is to be placed on the furnace under a muffle, ſurrounded with charcoal. Several of theſe ſmall crucibles may be placed under one muffle; and when they are properly diſpoſed, the aperture of the muffle ſhould have a large piece of burning charcoal put to it, and then the operator is to watch the proceſs, and ſee when the glaſs begins to look bright: this is the ſignal of its being fit to receive the impreſſion. The crucible is then to be taken out of the fire; and the hot glaſs muſt be preſſed down upon the mould with an iron inſtrument to make it receive the regular impreſſion: as ſoon as this is done, the crucible is to be ſet at the ſide of the furnace out of the way of the wind, that it may cool gradually without breaking. When it is cold, the glaſs is to be taken out, and its edges ſhould be grated round with pincers, which will prevent its flying afterwards, which is an accident that ſometimes happens when this caution has been omitted, eſpecially when the glaſs is naturally tender. The different coloured glaſſes are of different degrees of hardneſs, according to their compoſition; but the hardeſt to melt are always the beſt for this purpoſe, and this is known by a few trials. Gem.

If it be deſired to copy a ſtone in relief which is naturally in creux, or to take one in creux which is naturally in relief, there needs no more than to take an impreſſion firſt in wax or ſulphur, and to mould that upon the paſte of tripela inſtead of the ſtone itſelf; then proceeding in the manner before directed, the proceſs will have the deſired ſucceſs.

A more ſimple and eaſy method than the above, is by taking the caſts in gypſum, or plaſter of Paris as it is commonly called. For this purpoſe, the gypſum muſt be finely pulverized, and then mixed with clear water to the conſiſtence of thick cream. This is poured upon the face of the gem or ſeal of which the impreſſion is wanted, and which muſt be previouſly moiſted with oil to facilitate the ſeparation of the caſt; and in order to confine the liquid plaſter, it is only neceſſary to pin a ſlip of oiled paper round the ſides of the ſeal by way of a cap or rim. When the plaſter is dry, it is to be taken off, and ſet before the mouth of the furnace, in order to free it entirely from moiſture; when it is fit to be uſed as a matrix in the ſame way as that formed with the tripoli earths. Only no crucible or other receptacle is at all neceſſary; the caſts being formed like ſo many ſmall cakes half an inch thick, and thus put into the furnace with bits of glaſs upon them. The glaſs, after coming to a proper heat, is preſſed down upon the mould with an iron ſpatula to receive the deſired impreſſion, the preſſure requiſite being more or leſs according to the ſize of the ſtone. This method has been long practiſed very ſucceſsfully, and

with

Gem. with no ſmall emolument, by that ingenious ſeal engraver Mr Deuchar of Edinburgh. The only reſpect in which it is inferior to the other more operoſe and expenſive methods, conſiſts in the chance of air bubbles ariſing in pouring on the plaſter; which chance, however, is leſs in proportion to the fineneſs of the gypſum employed. When air bubbles do occur, the caſts may be laid aſide, as it is ſo eaſy to replace them.

The application of paſtes to multiply and preſerve the impreſſions of camaieux and intaglios, is an object very intereſting to artiſts and to antiquaries, as well as to men of learning and taſte in the fine arts.

This art, though only lately reſtored in any degree of perfection, is of very conſiderable antiquity. The great prices which the ancients paid for the elegant gems engraved by the celebrated Greek artiſts, could not but early ſuggeſt to them the idea of multiplying their numbers, by taking off their impreſſions in wax, in ſulphur, in plaſter, or in clay; but more particularly in coloured glaſs, or that vitrified ſubſtance commonly called *paſte*.

As the impreſſions on paſte are durable, and imitate the colours and brilliancy of the original ſtones, they ſerve the ſame purpoſes as the gems themſelves. This art was therefore practiſed not only by the Greeks, but by all the nations who cultivated Grecian taſte.

Many of the fineſt gems of antiquity are now loſt, and their impreſſions are to be found only on ancient paſtes. Great therefore is the value of theſe paſtes. Numerous collections of them have been formed by the curious. Inſtances of this are found in the Florentine Muſæum, in Stoſch's work on ancient gems with inſcriptions, in Winkelmann's deſcription of Stoſch's cabinet, and in the noble collection of Mr Charles Townley in London.

The art of taking impreſſions of gems ſeems not to have been altogether loſt even in the Gothic ages; for Heraclius, who probably lived in the ninth century, and wrote a book *De coloribus et artibus Romanorum*, teaches in very plain though not elegant terms how to make them. Indeed, ſome of the few perſons who then poſſeſſed this art, taking advantage of the ignorance of the times, ſold paſtes for original gems. Thus the famous emerald of the abbey of Reichnaw near Conſtance, although a preſent made by Charlemagne, is now found to be a piece of glaſs. And thus the celebrated emerald vaſe in the cathedral of Genoa is likewiſe found to be a piece of paſte (A). The Geneoſe got this vaſe at the taking of Ceſarea in the year 1101 as an equivalent for a large ſum of money; nor was any impoſition then ſuſpected, for in the year 1319 they pawned it for 1200 merks of gold.

But this ingenious art, revived indeed in Italy in the time of Laurence of Medici and Pope Leo X. was not cultivated in an extenſive manner till the beginning of the preſent century, when M. Homberg reſtored it, as already mentioned. In this he is ſaid to have been greatly aſſiſted and encouraged by the then duke of Orleans regent of France, who uſed to amuſe himſelf with that celebrated chemiſt in taking off impreſſions in paſte from the king of France's, from his own, and other collections of gems. Gem.

According to the French Encyclopediſts, M. Clachant the elder, an engraver of ſome note, who died at Paris in 1781, learned this art from his royal highneſs, to whoſe houſehold his father or he ſeems to have belonged. Mademoiſelle Feloix next cultivated this art, and it is believed ſtill carries it on. She had been taught by her father, who in quality of garçon de chambre to the regent had often aſſiſted in the laboratory of his maſter, where he acquired this knowledge. Her collection conſiſts of 1800 articles.

Baron Stoſch, a Pruſſian, who travelled over Europe in queſt of original engraved ſtones and impreſſions of ancient gems for the elegant work which he publiſhed and Picart engraved (B), was well acquainted with this art. He had taught it to his ſervant Chriſtian Dehn, who ſettled at Rome, where he made and ſold his well known ſulphur impreſſions and paſtes. He had collected 2500 articles. Dolce has arranged them in a ſcientific order, and given a deſcriptive catalogue of them.

It was chiefly from Dehn's collection that the taſte for ſulphurs and paſtes has become ſo univerſal. They are great objects of ſtudy, and often require much learning to explain them. They have unqueſtionably ſerved to extend and improve the art of engraving on ſtones; and have been of infinite uſe to painters, to ſtatuaries, and to other artiſts, as well as to men of claſſical learning and fine taſte.

It is very difficult to take off impreſſions, and perfectly to imitate various-coloured cameos. It cannot be properly done in wax, ſulphur, plaſter, or glaſs of one colour only. The difficulties ariſing from their ſize and form, and from the various nature of the different ſorts of glaſs which do not well unite into different ſtrata, are very numerous: nor could the completeſt ſucceſs in this chemical and mechanical branch of the art produce a tolerable cameo. Impreſſions or imitations, if unaſſiſted by the tool of the engraver, do not ſucceed: becauſe the undercutting and deep work of moſt of the originals require to be filled up with clay or wax, that the moulds may come off ſafe without injuring them. Hence the impreſſions from theſe moulds come off hard and deſtitute of delicacy, ſharpneſs, and preciſion of outline, till the underworking of the moulder is cut away. But Mr Reiffenſtein at Rome, by his genius, perſeverance, and the aſſiſtance of able artiſts, has overcome theſe difficulties; and has had the ſatisfaction of ſucceeding, and producing variegated cameos which can hardly be diſtinguiſhed from the originals.

Mr Lippart of Dreſden, an ingenious glazier, and an enthuſiaſt in the fine arts, practiſed this branch not unſucceſsfully; but not finding ſufficient encouragement for his paſtes of coloured glaſs, or perhaps from local difficulties in making them well and cheap, he abandoned

(A) See M. de la Condamine's Diſſ. in Memoir, de l'Acad. Roy. de Paris, 1757.

(B) Gemmæ antiquæ coloratæ, ſculptorum nominibus inſignitæ, ære inciſæ per Bernardum Picart. Amſtelodam. 1724, folio.

Gem. doned this art. He ſubſtituted in its place impreſſions of fine white alabaſter or ſelenite plaſter. Such impreſſions when carefully ſoaked in a ſolution of white Caſtile ſoap, then dried, and rubbed over with a ſoft bruſh, take a very agreeable poliſh. They ſhow the work perhaps to better advantage than red or white ſulphurs do; but they are not ſo durable, and are liable to be defaced by rubbing.

Of theſe impreſſions Mr Lippart publiſhed three different collections, each of them containing 1000 articles; and to the merit of having increaſed the number of Madamoiſelle Feloix and Chriſtiano Dehn's collections, which are all inſerted in his, he added that of employing two learned Germans to arrange and deſcribe them. The firſt thouſand were arranged and deſcribed by the late Profeſſor Chriſt at Leipſic, and the ſecond and third thouſand by Profeſſor Heine at Goettingen. Nor did Mr Lippart ſtop here: but to make the ſtudy of antiquity more eaſy and acceptable to artiſts, he ſelected out of the whole collection of 3000, a ſmaller one of 2000 of the beſt and more inſtructive ſubjects, of which he himſelf drew up and publiſhed a deſcription in German.

But of all the artiſts and ingenious men who have taken impreſſions of engraved gems in ſulphur and in paſte, no one ſeems to have carried that art to ſuch perfection as Mr James Taſſie, a native of Glaſgow, who reſided in London from the year 1766 till his death. His knowledge in various branches of the fine arts, particularly in that of drawing, naturally led him to it. The elegant portraits which he modelled in wax, and afterwards moulded and caſt in paſte, and which entirely reſemble cameos, are well known to the public.

Mr Taſſie, profiting of all the former publications of this ſort, and by expence, induſtry, and acceſs to many cabinets in England and other kingdoms to which former artiſts had not obtained admiſſion, was enabled to increaſe his collection of impreſſions of ancient and modern gems to the number of above 15,000 articles. It is the greateſt collection of this kind that ever exiſted; and ſerves for all the purpoſes of artiſts, antiquaries, ſcholars, men of taſte, and even philoſophers. The great demand for his paſtes was perhaps owing in the beginning to the London jewellers, who introduced them into faſhion by ſetting them in rings, ſeals, bracelets, necklaces, and other trinkets.

The reputation of this collection having reached the empreſs of Ruſſia, ſhe was pleaſed to order a complete ſet; which being accordingly executed in the beſt and moſt durable manner, were arranged in elegant cabinets, and are now placed in the noble apartments of her imperial majeſty's ſuperb palace at Czarſko Zelo.

Mr Taſſie, in executing his commiſſion, availed himſelf of all the advantages which the improved ſtate of chemiſtry, the various ornamental arts, and the knowledge of the age, ſeemed to afford. The impreſſions were taken in a beautiful white enamel compoſition, which is not ſubject to ſhrink or form air bladders; which emits fire when ſtruck with ſteel, and takes a fine poliſh; and which ſhows every ſtroke and touch of the artiſt in higher perfection than any other ſubſtance. When the colours, mixed colours, and nature of the reſpective originals, could be aſcertained, they were imitated as completely as art can imitate them; inſomuch that many of the paſte intaglios and cameos in this collection are ſuch faithful imitations, that artiſts themſelves have owned they could hardly be diſtinguiſhed from the originals. And when the colour and nature of the gems could not be authenticated, the paſtes were executed in agreeable, and chiefly tranſparent, colours; conſtant attention being beſtowed to preſerve the outlines, extremities, attributes, and inſcriptions.

It was the learned Mr Raſpe (from whom this account (c) is taken) who arranged this great collection, and made out the deſcriptive catalogue. His arrangement is nearly the ſame with that of the late Abbé Winkelmann, in his deſcription of the gems which belonged to Baron Stoſch. But as modern works were inſerted in this collection, he found it neceſſary to make a few alterations, and added ſome diviſions to thoſe of M. Winkelmann, as will appear from the following conſpectus, with which we ſhall conclude this detail.

I. Ancient Art and Engravings.
- Egyptian hieroglyphics, ſacred animals, divinities, prieſts.
- Baſilidian, Gnoſtic, and other taliſmans, &c.
- Oriental and barbarous ancient and modern engravings.
- Greek and Roman original copies, and imitations (the Etruſcan are claſſed with the Greek works).
- A, Mythology or fabulous age. Gods, inferior divinities, religious ceremonies.
- B, Heroic age before the ſiege of Troy.
- C, Siege of Troy.
- D, Hiſtoric age. Of Carthage, Greece, Rome, ſubjects unknown.
- E, Fabulous animals and chimeras.
- F, Vaſes and urns.

II. Modern Art and Engravings.
- A, Religious ſubjects.
- B, Portraits of kings and ſovereigns.
- C, Portraits of illuſtrious men in alphabetical order.
- D, Portraits unknown.
- E, Devices and emblems.
- F, Cyphers, arms, ſupporters, and medley of modern hiſtory.

GEMAPPE, a village of Auſtrian Hainault, three miles weſt-by-ſouth of Mons, rendered memorable for a victory which the French under General Dumourier obtained over the Auſtrians, Nov. 5. 1792; in which the carnage on both ſides was ſo dreadful, that three coal pits in the vicinity were filled up with the dead bodies of men and horſes.

GEMARA, or GHEMARA, the ſecond part of the TALMUD. Gem ‖ Gemara.

The

(c) Account of the preſent ſtate and arrangement of Mr James Taſſie's collection of paſtes and impreſſions from ancient and modern gems, by R. C. Raſpe, London, 1786, 8vo.

Gemara || Geminiani.

The word גמרה *gemara*, is commonly ſuppoſed to denote a ſupplement; but in ſtrictneſs it rather ſignifies complement, perfection: being formed of the Chaldee גמר, *gemar*, or *ghemer*, "to finiſh, perfect, or complete any thing."

The rabbins call the Pentateuch ſimply the *law*: the firſt part of the Talmud, which is only an explication of that law, or an application thereof to particular caſes, with the deciſions of the ancient rabbins thereon, they call the *Miſchna*, i. e. "ſecond law:" and the ſecond part, which is a more extenſive and ample explication of the ſame law, and a collection of deciſions of the rabbins poſterior to the Miſchna, they call *Gemara*, q. d. "perfection, completion, finiſhing;" becauſe they eſteem it the finiſhing of the law, or an explication beyond which there is nothing farther to be deſired.

The Gemara is uſually called ſimply *Talmud*, the common name of the whole work. In this ſenſe we ſay, there are two Gemaras or Talmuds; that of Jeruſalem and that of Babylon: though in ſtrictneſs the Gemara is only an explication of the Miſchna, given by the Jewiſh doctors in their ſchools: much as the commentaries of our ſchool divines on St Thomas, or the maſter of the ſentences, are an explication of the writings of thoſe authors.

A commentary, Monſ. Tillemont obſerves, was wrote on the Miſchna, by one Johanan, whom the Jews place about the end of the ſecond century; but Fa. Morin proves, from the work itſelf, wherein mention is made of the Turks, that it was not wrote till the time of Heraclius, or about the year 620; and this is what is called the *Gemara*, or *Talmud of Jeruſalem*, which the Jews do not uſe or eſteem much becauſe of its obſcurity.

They ſet a much greater value on the Gemara, or Talmud of Babylon, begun by one Aſa; diſcontinued for 73 years, on occaſion of the wars with the Saracens and Perſians; and finiſhed by one Joſa, about the cloſe of the ſeventh century. See TALMUD.

Though the name Talmud, in its latitude, includes both the Miſchna and the two Gemaras, yet it is properly that of Aſa and Joſa alone which is meant under that name. This the Jews prize above all their other writings, and even ſet it on a level with Scripture itſelf: in effect, they conceive it as the word of God, derived by tradition from Moſes, and preſerved without interruption to their time. R. Jehuda, and afterwards R. Johanan, R. Aſa, and R. Joſa, fearing the traditions ſhould be loſt in the diſperſion of the Jews, collected them into the Miſchna and the Gemara. See CARAITES and RABBINISTS.

GEMINI, in *Aſtronomy*, the TWINS; a conſtellation or ſign of the zodiac, the third in order, repreſenting Caſtor and Pollux; and it is marked thus, ♊. The ſtars in the ſign Gemini, in Ptolemy's catalogue, are 25; in Tycho's, 25; in Hevelius's, 38; in the Britannic Catalogue, 85.

GEMINIANI, a celebrated muſician and compoſer, was born at Lucca in the year 1680. He received his firſt inſtructions in muſic from Aleſſandro Scarlatti; and after that became a pupil of Carlo Ambroſio Lunati, ſurnamed *Il Gobbo*, a moſt celebrated performer on the violin; after which he became a diſciple of Corelli, and under him finiſhed his ſtudies on that inſtrument. In the year 1714 he came to England; where in a ſhort time he ſo recommended himſelf by his exquiſite performance, that all who profeſſed to love and underſtand muſic were captivated with hearing him.—Many of the nobility laid claim to the honour of being his patrons; but he ſeemed chiefly to attach himſelf to Baron Kilmanſegge, chamberlain to King George I. as elector of Hanover, and a favourite of that prince. In 1716, he publiſhed and dedicated to his patron 12 ſonatas *a violino violone e cembalo*: the firſt ſix with fugues, or double ſtops as they are vulgarly called; the laſt with airs of various meaſures, ſuch as allemandes, courantes, and jiggs. This publication was ſo well reliſhed by the baron, that he mentioned Geminiani to the king as an excellent performer; in conſequence of which our muſician had the honour to perform before his majeſty, in concert with the celebrated Handel, who played on the harpſichord. But though Geminiani was exceedingly admired, yet he had not a talent at aſſociating muſic with poetry, nor do we find that he ever became a public performer: he was therefore obliged to depend for his ſubſiſtence on the friendſhip of his patrons and the profits which accrued to him from teaching. He had alſo the misfortune to be an enthuſiaſt in painting; and the verſatility of his temper was ſuch, that, in order to gratify this paſſion, he not only ſuſpended his ſtudies, and neglected to exerciſe his talents, but involved himſelf in debts. In 1727, he was offered the place of maſter and compoſer of the ſtate muſic in Ireland; but this could not be conferred on a Catholic, and Geminiani refuſed to change his religion: upon which it was given to Matthew Dubourg, a young man who had been one of his pupils, and was a celebrated performer on the violin. Geminiani then ſet himſelf to compoſe parts to the *opera quinta* of Corelli; or, in other words, to make concertos of the firſt ſix of his ſolos. This work he completed, and, with the help of a ſubſcription, at the head of which were the names of the royal family, publiſhed in 1726. In 1732, he publiſhed his *opera ſeconda*, which contains a celebrated minuet that goes by his name. He publiſhed many other pieces, the profits of which did not much mend his circumſtances; but this perhaps was owing to his rambling diſpoſition and enthuſiaſtic fondneſs of painting. He was alſo an utter ſtranger to the buſineſs of an orcheſtra, and had no idea of the labour and pains neceſſary in the inſtruction of ſingers for the performance of muſic to which they were ſtrangers. The conſequence of this was, that a *concerto ſpirituale*, which he had advertiſed for his own benefit in 1748, failed in the performance. The audience, however, compaſſionated his diſtreſs, and ſat very ſilent till the books were changed; when the performance was continued with compoſitions of the author's own, and which he executed in ſuch a manner as was never forgotten. The profits ariſing from this performance enabled him to take a journey to Paris; where he ſtaid long enough to get plates engraven for a ſcore of ſolos, and the parts of two operas of concertos. About the year 1755 he returned to England, and advertiſed them for ſale.—In 1761 Geminiani went over to Ireland; and was kindly entertained there by Mr Matthew Dubourg, who had been his pupil, and was then maſter of the king's band in Ireland. This perſon through the courſe

Geminiani.

Geminiani, Gemma.

courſe of his life had ever been diſpoſed to render him friendly offices; and it was but a ſhort time after Geminiani's arrival at Dublin that he was called upon to do him the laſt. It appears that Geminiani had ſpent many years in compiling an elaborate treatiſe on muſic, which he intended for publication; but ſoon after his arrival at Dublin, by the treachery of a female ſervant, who, it was ſaid, was recommended to him for no other end than that ſhe might ſteal it, it was conveyed away, and could not be recovered. The greatneſs of this loſs, and his inability to repair it, made a deep impreſſion on his mind; and, as it is conjectured, haſtened his end; at leaſt he ſurvived it but a ſhort time, ending his days on the 17th of September 1762. The following liſt compriſes the whole of his publications, except two or three articles of ſmall account: Twelve ſolos for a violin, *opera prima;* ſix concertos in ſeven parts, *opera ſeconda;* ſix concertos in ſeven parts, *opera terza;* twelve ſolos for a violin, *opera quarta;* ſix ſolos for a violoncello, *opera quinta;* the ſame made into ſolos for a violin; ſix concertos from his *opera quarta;* ſix concertos in eight parts, *opera ſettima;* rules for playing in taſte; a treatiſe on good taſte; the art of playing the violin; 12 ſonatas from his firſt ſolos, *opera undecima;* Ripieno parts to ditto; leſſons for the harpſichord; *Guida Armonica;* ſupplement to ditto; the art of accompaniment, two books; his firſt two operas of concertos in ſcore; and the Enchanted Foreſt.—Of his ſolos the *opera prima* is eſteemed the beſt. Of his concertos ſome are excellent, others of them ſcarce paſs the bounds of mediocrity. The ſixth of the third opera not only ſurpaſſes all the reſt, but, in the opinion of the beſt judges of harmony, is the fineſt inſtrumental compoſition extant.

GEMMA, or Bud, in *Botany:* a compendium or epitome of a plant, ſeated upon the ſtem and branches, and covered with ſcales, in order to defend the tender rudiments encloſed from cold and other external injuries, till, their parts being unfolded, they acquire ſtrength, and render any further protection unneceſſary.

Buds, together with bulbs, which are a ſpecies of buds generally ſeated upon or near the root, conſtitute that part of the herb called by Linnæus *hybernacula;* that is, the winter quarters of the future vegetable: a very proper appellation, as it is during that ſevere ſeaſon that the tender rudiments are protected in the manner juſt mentioned.

Plants, conſidered in analogy to animals, may properly enough be reckoned both viviparous and oviparous. Seeds are the vegetable eggs; buds, living fetuſes, or infant plants, which renew the ſpecies as certainly as the ſeeds.

Buds are placed at the extremity of the young ſhoots, and along the branches, being fixed by a ſhort footſtalk upon a kind of brackets, the remainder of the leaves, in the wings or angles of which the buds in queſtion were formed the preceding year. They are ſometimes placed ſingle; ſometimes two by two, and thoſe either oppoſite or alternate; ſometimes collected in greater numbers in whirls or rings.

With reſpect to their conſtruction, buds are compoſed of ſeveral parts artificially arranged. Externally, we find a number of ſcales that are pretty hard, frequently armed with hairs, hollowed like a ſpoon, and placed over each other like tiles. Theſe ſcales are fixed into the inner plates of the bark, of which they appear to be a prolongation. Their uſe is to defend the internal parts of the bud; which, being unfolded, will produce, ſome, flowers, leaves, and ſtipulæ; others, footſtalks and ſcales. All theſe parts, while they remain in the bud, are tender, delicate, folded over each other, and covered with a thick clammy juice, which is ſometimes reſinous and odoriferous, as in the tacamahac tree. This juice ſerves not only to defend the more tender parts of the embyro plant from cold, the aſſaults of inſects, and other external injuries; but likewiſe from exceſſive perſpiration, which, in its young and infant ſtate, would be very deſtructive. It is conſpicuous in the buds of horſe cheſnut, poplar, and willow trees. Gemma.

In general, we may diſtinguiſh three kinds of buds; that containing the flower, that containing the leaves, and that containing both flower and leaves.

The firſt, termed *gemma florifera*, and by the French *bouton à fleur* or *à fruit*, contains the rudiments of one or ſeveral flowers, folded over each other, and ſurrounded with ſcales. In ſeveral trees, this kind of bud is commonly found at the extremity of certain ſmall branches, which are ſhorter, rougher, and leſs garniſhed with leaves, than the reſt. The external ſcales of this ſpecies of bud are harder than the internal; both are furniſhed with hairs, and in general more ſwelled than thoſe of the ſecond ſort. The bud containing the flower too is commonly thicker, ſhorter, almoſt ſquare, leſs uniform, and leſs pointed; being generally terminated obtuſely. It is called by Pliny *oculus gemmæ;* and is employed in that ſpecies of grafting called *inoculation*, or *budding*.

The ſecond ſpecies of bud, viz. that containing the leaves, termed *gemma folifera*, and by the French *bouton à feuilles* or *à bois*, contains the rudiments of ſeveral leaves, which are variouſly folded over each other, and outwardly ſurrounded by ſcales, from which the ſmall ſtipulæ that are ſeated on the foot of the young branches are chiefly produced. Theſe buds are commonly more pointed than the former ſort. In the hazel nut, however, they are perfectly round; and in horſe cheſnut, very thick.

The third ſort of bud is ſmaller than either of the preceding; and produces both flowers and leaves, though not always in the ſame manner. Sometimes the flowers and leaves are unfolded at the ſame time. This mode of the flower and leaf bud is termed by Linnæus *gemma folifera et florifera*. Sometimes the leaves proceed or emerge out of this kind of bud upon a ſmall branch, which afterwards produces flowers. This mode of the flower and leaf bud is termed by Linnæus *gemma folifera florifera*, and is the moſt common bud of any.

Such buds as produce branches adorned only with leaves, are called *barren;* ſuch as contain both leaves and flowers, *fertile*. From the bulk of the bud we may often with eaſe foretel whether it contains leaves only, or leaves and flowers together, as in cherry and pear trees.

Neither the buds produced on or near the root, called by ſome authors *turiones*, nor thoſe produced on the trunk, and from the angles or wings of the leaves, contain, in ſtrict propriety, an entire delineation of the plant: ſince the roots are wanting; and in various

Gemma. buds, as we have ſeen, ſhoots are contained with leaves only, and not with flowers: but as a branch may be conſidered as a part ſimilar to the whole plant, and, if planted, would in proceſs of revegetation exhibit or produce roots and flowers, we may in general allow, that the bud contains the whole plant, or the principles of the whole plant, which may be unfolded *ad libitum*; and thus reſembles the ſeed, in containing a delineation of the future plant in embryo: for although the bud wants a radicle, or plumula, of which the ſeed is poſſeſſed, yet it would undoubtedly form one, if planted in the earth. But as the medullary part adhering to the bud is too tender, and by the abundance of juice flowing into it from the earth would be diſpoſed to putrefaction, the buds are not planted in the ſoil, but generally inſerted within the bark of another tree; yet placed ſo that the production of the marrow, or pith, adhering to them, may be inſerted into the pith of the branch in which the fiſſure or cleft is made; by which means there is a large communication of juice. This propagation by gems or buds, called *inoculation*, is commonly practiſed with the firſt ſort of buds above deſcribed.

From the obvious uſes of the buds, we may collect the reaſon why the Supreme Author of nature has granted this ſort of protection to moſt of the trees that are natives of cold climates: and, on the other hand, denied it to ſuch as, enjoying a warm benign atmoſphere, have not the tender parts of their embryo ſhoots expoſed to injuries and depredations from the ſeverities of the weather. Of this latter kind are the plants of the following liſt; ſome of them very large trees; others ſmaller woody vegetables, of the ſhrub and under-ſhrub kind: Citron, orange, lemon, caſſava, mock orange, blad apple, ſhrubby ſwallow-wort, alaternus, ſhrubby geraniums, berry-bearing alder, Chriſt's thorn, Syrian mallow, boabab or Ethiopian ſour gourd, juſticia, mild ſena, the acacias and ſenſitive plant, coral tree, ſtinking bean trefoil, medicago, oleander, viburnum, ſumach, ivy, tamariſk, heath, Barbadoes cherry, lavatera, rue, ſhrubby nightſhades, Guinea henweed, cypreſs, lignum vitæ, and ſavine, a ſpecies of juniper.

On annual plants, whoſe root as well as ſtalk periſhes after a year, true buds are never produced; in their ſtead, however, are produced ſmall branches, like a little feather, from the wings of the leaves, which wither without any farther expanſion if the plants climb and have no lateral branches; but if, either by their own nature or from abundance of ſap, the plants become branched, the ramuli juſt mentioned obtain an increaſe ſimilar to that of the whole plant.

The ſame appearance obtains in the trees of warm countries, ſuch as thoſe enumerated in the above liſt, in which a plumula, or ſmall feather, ſends forth branches without a ſcaly covering; as, in ſuch countries, this tender part requires no defence or protection from cold. A ſcaly covering then is peculiar to buds, as it protects the tender embryo encloſed from all external injuries. When we therefore ſpeak of trees having buds that are naked or without ſcales, our meaning is the ſame as if we had ſaid that they have no buds at all.

The buds that are to be unfolded the following year, break forth from the evolved buds of the preſent year, in ſuch a manner as to put on the appearance of ſmall eminences in the wings or angles of the leaves. Theſe eminences or knots grow but little during the ſummer; as, in that ſeaſon, the ſap is expended on the increaſe of the parts of the plant: but in autumn, when the leaves begin to wither and fall off, the buds, placed on the wings, increaſe; and the embryo plant contained in the bud is ſo expanded, that the leaves and flowers, the parts to be evolved the following year, are diſtinctly viſible. Thus in horſe cheſnut the leaves, and in cornel tree the flowers, are each to be obſerved in their reſpective buds. Gemma || Gendarmes.

As each bud contains the rudiments of a plant, and would, if ſeparated from its parent vegetable, become every way ſimilar to it; Linnæus, to ſhow the wonderful fertility of nature, has made a calculation, by which it appears, that, in a trunk ſcarcely exceeding a ſpan in breadth, 10,000 buds (that is, herbs) may be produced. What an infinite number, then, of plants might be raiſed from a very large tree!

GEMMATIO, from *gemma*, "a bud;" a term uſed by Linnæus, expreſſive of the form of the buds, their origin, and their contents. It includes both thoſe properly called *buds*, and thoſe which are ſeated at the roots, ſtyled *bulbs*.

As to the origin of buds, they are formed either of the footſtalks of the leaves, of ſtipulæ, or of ſcales of the bark. Their contents have been already diſcovered, in the preceding article, to be either flowers, leaves, or both.

GEMONIÆ SCALÆ, or *Gradus GEMONII*, among the Romans, was much the ſame as gallows or gibbet in England.—Some ſay they were thus denominated from the perſon who raiſed them; others, from the firſt criminals that ſuffered on them; and others, from the verb *gemo*, "I ſigh or groan."

The *gradus gemonii*, according to Publius Victor or Sextus Rufus, was a place raiſed on ſeveral ſteps, from whence they precipitated their criminals; others repreſent it as a place whereon offenders were executed, and afterwards expoſed to public view. The *gemoniæ ſcalæ* were in the tenth region of the city, near the temple of Juno. Camillus firſt appropriated the place to this uſe, in the year of Rome 358.

GENDARMES, or GENS D'ARMES, in the French armies, a denomination given to a ſelect body of horſe, on account of their ſucceeding the ancient gendarmes, who were thus called from their being completely clothed in armour; (ſee *Scots GENDARMES*, *infra*.) Theſe troops were commanded by captain lieutenants, the king and the princes of the blood being their captains; the king's troop, beſides a captain-lieutenant, had two ſublieutenants, three enſigns, and three guidons.

Grand GENDARMES, latterly were a troop compoſed of 250 gentlemen; the king himſelf was their captain, and one of the firſt peers their captain-lieutenant, who had under him two lieutenants, three enſigns, three guidons, and other officers.

Small GENDARMES, were the Scots gendarmes, the queen's, the dauphin's, the gendarmes of Anjou, Burgundy, the Engliſh and Flemiſh gendarmes, having each a captain lieutenant, ſub-lieutenant, enſign, guidon, and quarter-maſter.

Scots GENDARMES, were originally inſtituted by Charles VII. of France, about the middle of the 15th century,

Gendarmes || Genealogy.

century, and formed a part of his guard; in which ſtation alſo they acted under other princes. It was their prerogative to take precedence of all the companies of the gendarmerie of France; and, on particular occaſions, they even preceded the two companies of the king's mouſquetaires. The ſons of the Scottiſh monarchs were the uſual captains of this company; and, after Mary's acceſſion to the throne, its command belonged to them as a right. It was thence that James VI. made a claim of it for his ſon Prince Henry. This honour, and its emoluments, were alſo enjoyed by Charles I. and the next in command to this prince was Louis Stuart duke of Lennox. George Gordon marquis of Huntly, ſucceeded the duke of Lennox in the year 1624, and took the title of captain or commander in chief when Charles I. mounted the Engliſh throne. It is not certain whether Charles II. was ever captain of this company; but it was conferred on his brother the duke of York, who was captain of the Scots gendarmes till the year 1667, when he reſigned his commiſſion into the hands of the French king. Since that time no native of Great Britain has enjoyed this command. See *Scots* GUARDS.

Stuart's Conſtit. of Scotland.

All the different gendarmeries are now aboliſhed, in conſequence of the reforming ſyſtems that have lately taken place in France.

GENDER, among grammarians, a diviſion of nouns, or names, to diſtinguiſh the two ſexes.

This was the original intention of gender: but afterwards other words, which had no proper relation either to one ſex or the other, had genders aſſigned them, rather out of caprice than reaſon; which is at length eſtabliſhed by cuſtom. Hence genders vary according to the languages, or even according to the words introduced from one language into another. Thus, *arbor* in Latin is feminine, but *arbre* in French is maſculine; and *dens* in Latin is maſculine, but *dent* in French is feminine.

The oriental languages frequently neglect the uſe of genders, and the Perſian language has none at all.

The Latins, Greeks, &c. generally content themſelves to expreſs the different genders by different terminations; as *bonus equus*, "a good horſe;" *bona equa*, "a good mare," &c. But in Engliſh we frequently go further, and expreſs the difference of ſex by different words: as boar, ſow; boy, girl; buck, doe; bull, cow; cock, hen; dog, bitch, &c.—We have only about 24 feminines, diſtinguiſhed from the males, by the variation of the termination of the male into *eſs*; of which number are abbot, abbeſs; count, counteſs; actor, actreſs; heir, heireſs; prince, princeſs, &c. which is all that our language knows of any thing like genders.

The Greek and Latin, beſides the maſculine and feminine, have the neuter, common, and the doubtful gender; and likewiſe the epicene, or promiſcuous, which under one ſingle gender and termination includes both the kinds.

GENEALOGY, an enumeration of a ſeries of anceſtors; or a ſummary account of the relations and alliances of a perſon or family, both in the direct and collateral line.

The word is Greek, γενεαλογια; which is formed of γενες, "race or lineage," and λογος, "diſcourſe."

In divers chapters and military orders, it is required, that the candidates produce their genealogy, to ſhow that they are noble by ſo many deſcents. Genealogy || General.

GENEALOGICA ARBOR, or *TREE of Conſanguinity*, ſignifies a genealogy or lineage drawn out under the figure of a tree, with its root, ſtock, branches, &c. The genealogical degrees are uſually repreſented in circles, ranged over, under, and aſide each other. This the Greeks called *ſtemmata*, a word ſignifying crown, garland, or the like. See the articles CONSANGUINITY and DESCENT, and the plates there referred to.

GENEP, a ſtrong town of Germany, in the circle of Weſtphalia, ſubject to the king of Pruſſia. E. Long. 4. 29. N. Lat. 51. 42.

GENERAL, an appellation given to whatever belongs to a whole genus.

GENERAL Aſſembly. See ASSEMBLY.

GENERAL Charge, in *Law.* See *CHARGE to enter Heir.*

GENERAL Terms, among logicians, thoſe which are made the ſigns of general ideas. See LOGIC and METAPHYSICS.

GENERAL Warrant. See WARRANT.

GENERAL of an Army, in the art of WAR, he who commands in chief. See the article WAR, where his office and duties are particularly explained.

GENERAL of the Artillery. See ORDNANCE.

GENERAL of Horſe, and *GENERAL of Foot*, are poſts next under the general of the army, and theſe have upon all occaſions an abſolute authority over all the horſe and foot in the army.

Adjutant GENERAL, one who attends the general, aſſiſts in council, and carries the general's orders to the army. He diſtributes the daily orders to the majors of brigade. He is likewiſe charged with the general detail of the duty of the army. The majors of brigade ſend every morning to the adjutant general an exact return, by battalion and company, of the men of his brigade. In a day of battle the adjutant general ſees the infantry drawn up; after which, he places himſelf by the general, to receive any orders which may regard the corps of which he has the detail. In a ſiege, he orders the number of workmen demanded, and ſigns the warrant for their payment. He receives the guards of the trenches at their rendezvous, and examines their condition; he gives and ſigns all orders for parties. He has an orderly ſerjeant from each brigade of infantry in the line, to carry ſuch orders as he may have occaſion to ſend from the general.

Lieutenant GENERAL, is the next in command after the general; and provided he ſhould die or be killed, the order is, that the oldeſt lieutenant general ſhall take the command. This office is the firſt military dignity after that of general. One part of their function is, to aſſiſt the general with their council: they ought therefore, if poſſible, to poſſeſs the ſame qualities with the general himſelf; and the more, as they often command armies in chief.

The number of lieutenant generals has been multiplied of late in Europe, in proportion as the armies have become numerous. They ſerve either in the field, or in ſieges, according to the dates of their commiſſions. In battle, the oldeſt commands the right wing of the army, the ſecond the left wing, the third the centre,

General. the fourth the right wing of the second line, the fifth the left wing, the sixth the centre; and so on. In sieges, the lieutenant generals always command the right of the principal attack, and order what they judge proper for the advancement of the siege during the 24 hours they are in the trenches: except the attacks, which they are not to make without an order from the general in chief.

Lieutenant GENERAL *of the Ordnance.* See ORDNANCE.

Lieutenant GENERAL *of Artillery*, is, or ought to be, a very great mathematician, and an able engineer; to know all the powers of artillery; to understand the attack and defence of fortified places, in all its different branches; how to dispose of the artillery in the day of battle to the best advantage; to conduct its march and retreat; as also to be well acquainted with all the numerous apparatus belonging to the train, and to the laboratory, &c.

Major GENERAL, the next officer to the lieutenant general. His chief business is to receive orders from the general, or in his absence from the lieutenant general of the day; which he is to distribute to the brigade majors, with whom he is to regulate the guards, convoys, detachments, &c. On him rests the whole fatigue and detail of duty of the army roll. It is the major general of the day who is charged with the encampment of the army, who places himself at the head of it when they march, who marks out the ground of the camp to the quartermaster general, and who places the new guards for the safety of the camp.

The day the army is to march, he dictates to the field officers the order of the march, which he has received from the general, and on other days gives them the parole.

In a fixed camp he is charged with the foraging, with reconnoitring the ground for it, and posting the escorts, &c.

In sieges, if there are two separate attacks, the second belongs to him; but if there is but one, he takes, either from the right or left of the attack, that which the lieutenant general has not chosen.

When the army is under arms, he assists the lieutenant general, whose orders he executes.

If the army marches to an engagement, his post is at the head of the guards of the army, until they are near enough to the enemy to rejoin their different corps; after which he retires to his own proper post: for the major generals are disposed on the order of battle as the lieutenant generals are; to whom, however, they are subordinate, for the command of their divisions. The major-general has one aid-de-camp, paid for executing his orders.

GENERAL is also used for a particular march, or beat of drum; being the first which gives notice, commonly in the morning early, for the infantry to be in readiness to march.

GENERAL is likewise an appellation by which officers in law, in the revenues, &c. are distinguished; as *attorney general*, *solicitor general*, &c. *receiver general*, *comptroller general*, &c. See ATTORNEY, &c.

GENERAL is also used for the chief of an order of monks, or of all the houses and congregations established under the same rule. Thus we say, the general of the Franciscans, Cistertians, &c.

GENERALISSIMO, called also *captain general*, and simply *general*, is an officer who commands all the military powers of a nation; who gives orders to all the other general officers; and receives no orders himself but from the king. Generalissimo || Generation.

M. Balzac observes, that the cardinal de Richelieu first coined this word, of his own absolute authority, upon his going to command the French army in Italy.

GENERATE, in *Music*, is used to signify the operation of that mechanical power in nature, which every sound has in producing one or more different sounds. Thus any given sound, however simple, produces along with itself, its octave, and two other sounds extremely sharp, viz. its twelfth above, that is to say, the octave of its fifth; and the other the seventeenth above, or, in other words, the double octave of its third major.

Whether we suppose this procreation of sounds to result from an aptitude in the texture and magnitude of certain particles in the air, for conveying to our ears vibrations that bear those proportions, one to another, as being determined at once by the partial and total oscillations of any musical string; or from whatever economy of nature we choose to trace it; the power of one sound thus to produce another, when in action, is said to *generate*. The same word is applied, by Signior Tartini and his followers, to any two sounds which, simultaneously heard, produce a third.

GENERATED, or GENITED, is used, by some mathematical writers, for whatever is produced, either in arithmetic, by the multiplication, division, or extraction of roots; or in geometry, by the invention of the contents, areas, and sides; or of extreme and mean proportionals, without arithmetical addition and subtraction.

GENERATING LINE, or FIGURE, in *Geometry*, is that which, by its motion of revolution, produces any other figure, plane or solid. See GENESIS.

GENERATION, in *Physiology*, the act of procreating and producing a being similar to the parent. See ANATOMY, N° 157.

GENERATION of Fishes. See *COMPARATIVE Anatomy*, N° 304, and ICHTHYOLOGY.

GENERATION of Plants. See BOTANY.

GENERATION of Insects. See *COMPARATIVE Anatomy*, p. 312, and ENTOMOLOGY, p. 234.

Parts of GENERATION. See ANATOMY, N° 157.

GENERATION, in *Mathematics*, is used for formation or production. Thus we meet with the generation of equations, curves, solids, &c.

GENERATION, in *Theology*. The Father is said by some divines to have produced his Word or Son from all eternity, by way of generation; on which occasion the word *generation* raises a peculiar idea: that procession, which is really effected in the way of understanding, is called *generation*, because in virtue thereof, the Word becomes like to him from whom he takes this original; or, as St Paul expresses it, is the figure or image of his substance, i. e. of his being and nature. And hence it is, they say, that the second Person in the Trinity is called the Son.

GENERATION is also used, though somewhat improperly, for genealogy, or the series of children issued from the same stock. Thus the gospel of St Matthew commences with the book of the generation of Jesus Christ,

Generation ‖ Genesis

Chriſt, &c. The latter and more accurate tranſlators, inſtead of *generation* uſe the word *genealogy*.

GENERATION is alſo uſed to ſignify a people, race, or nation, eſpecially in the literal tranſlations of the Scripture, where the word generally occurs wherever the Latin has *generatio*, and the Greek γενεσις. Thus, "A wicked and perverſe generation ſeeketh a ſign," &c. "One generation paſſes away, and another cometh," &c.

GENERATION is alſo uſed in the ſenſe of an age, or the ordinary period of man's life. Thus we ſay, "to the third and fourth generation." In this ſenſe hiſtorians uſually reckon a generation the ſpace of 33 years or thereabouts. See AGE.

Herodotus makes three generations in a hundred years; which computation appears from the latter authors of political arithmetic to be pretty juſt.

GENERATOR, in *Muſic*, ſignifies the principal ſound or ſounds by which others are produced. Thus the loweſt C for the treble of the harpſichord, beſides its octave, will ſtrike an attentive ear with its twelfth above, or G in alt, and with its ſeventeenth above, or E in alt. The C, therefore, is called their *generator*, the G and E its products or harmonics. But in the approximation of chords, for G, its octave below is ſubſtituted, which conſtitutes a fifth from the generator, or loweſt C; and for E, is likewiſe ſubſtituted its fifteenth below, which, with the above-mentioned C, forms a third major. To the loweſt notes, therefore, exchanged for thoſe in alt by ſubſtitution, the denominations of products or harmonics are likewiſe given, whilſt the C retains the name of their *generator*. But ſtill according to the ſyſtem of Tartini, two notes in concord, which when ſounded produce a third, may be termed the *concurring generators* of that third. (See *Generation Harmonique, per M. Rameau;* ſee alſo that delineation of Tartini's ſyſtem called The Power and Principles of Harmony).

GENERICAL NAME, in *Natural Hiſtory*, the word uſed to ſignify all the ſpecies of natural bodies, which agree in certain eſſential and peculiar characters, and therefore all of the ſame family or kind; ſo that the word uſed as the generical name equally expreſſes every one of them, and ſome other words expreſſive of the peculiar qualities or figures of each are added, in order to denote them ſingly, and make up what is called the ſpecific name. See BOTANY and *NATURAL Hiſtory*.

GENESIS, the firſt book of the Old Teſtament, containing the hiſtory of the creation, and the lives of the firſt patriarchs.

The book of Geneſis ſtands at the head of the Pentateuch. Its author is held to be Moſes: it contains the relation of 2369 years, viz. from the beginning of the world to the death of Joſeph. The Jews are forbidden to read the beginning of Geneſis, and the beginning of Ezekiel, before 30 years of age.

The Hebrews call this book *Bereſchith*, becauſe it begins with that word, which in their language ſignifies *in principio*, or "in the beginning." Greeks gave give it the name *Geneſis*, Γενεσις, q. d. production, generation, becauſe it begins with the hiſtory of the production or generation of all beings.

This book, beſides the hiſtory of the creation, contains an account of the original innocence and fall of man; the propagation of mankind; the riſe of religion; the general defection and corruption of the world; the deluge; the reſtoration of the world; the diviſion and peopling of the earth; and the hiſtory of the firſt patriarchs to the death of Joſeph. It was eaſy for Moſes to be ſatisfied of the truth of what he delivers in this book, becauſe it came down to him through a few hands; for from Adam to Noah there was one man, viz. Methuſelah, who lived ſo long as to ſee them both: in like manner Shem converſed with Noah and Abraham; Iſaac with Abraham and Joſeph, from whom the records of this book might eaſily be conveyed to Moſes by Amram, who was contemporary with Joſeph.

Geneſis ‖ Geneva

GENESIS, in *Geometry*, denotes the formation of a line, plane, or ſolid, by the motion or flux of a point, line, or ſurface. See FLUXIONS.

The geneſis or formation, *e. gr.* of a globe or ſphere, is conceived by ſuppoſing a ſemicircle to revolve upon a right line, drawn from one extreme thereof to the other, called its axis, or axis of circumvolution: the motion or revolution of that ſemicircle is the geneſis of the ſphere, &c.

In the geneſis of figures, &c. the line or ſurface that moves is called the *deſcribent;* and the line round which, or according to which, the revolution or motion is made, the *dirigent*.

GENET, GENNET, or *Jennet*, in the manege, denotes a ſmall-ſized well-proportioned Spaniſh horſe.

To ride *à la genette*, is to ride after the Spaniſh faſhion, ſo ſhort, that the ſpurs bear upon the horſe's flank.

GENETHLIA, in antiquity, a ſolemnity kept in memory of ſome perſon deceaſed.

GENETHLIACI, in *Aſtrology*, perſons who erect horoſcopes, or pretend to foretel what ſhall befal a man by means of the ſtars which preſided at his nativity. The word is formed of the Greek γενεθλη, *origin, generation, nativity*.

The ancients called them *Chaldæi*, and by the general name *mathematici:* accordingly, the ſeveral civil and canon laws, which we find made againſt the mathematicians, only reſpect the *genethliaci* or aſtrologers.

They were expelled Rome by a formal decree of the ſenate; and yet found ſo much protection from the credulity of the people, that they remained therein unmoleſted. Hence an ancient author ſpeaks of them as *hominum genus quod in civitate noſtra ſemper et vetabitur et retinebetur*.

GENETTE, in *Zoology*. See VIVERRA, MAMMALIA *Index*.

GENEVA, a city of Switzerland, on the confines of France and Savoy, ſituated in 6° E. Long. and 46° 12′ 9″ N. Lat. It ſtands on the banks of the river Rhone, juſt at the place where the latter iſſues from the lake which takes its name from the city; and part of it is built on an iſland in the river. It is handſome, well fortified, and pretty large; the ſtreets in general are clean and well paved, but the principal one is encumbered with a row of ſhops on each ſide between the carriage and foot-path. The latter is very wide, and protected from the weather by great wooden penthouſes projecting from the roofs; which, though very convenient, give the ſtreet a dark and dull appearance. The houſes are generally conſtructed of freeſtone, with baſements of limeſtone; the gutters, ſpouts, ridges,

Geneva. ridges, and outward ornaments, being made of tinned iron. Some of them have arched walks or piazzas in front. The place called *Treille* is very agreeable, being planted with linden trees, and commanding a fine proſpect of the lake, with ſeveral ranges of rocks riſing behind one another, ſome covered with vineyards and herbage, and others with ſnow, having openings betweent hem. Immediately below Geneva the Rhone is joined by the Arve, a cold and muddy ſtream riſing among the Alps, and deriving a conſiderable part of its waters from the Glaciers. The Rhone is quite clear and tranſparent, ſo that the muddy water of the Arve is diſtinguiſhable from it even after they have flowed for ſeveral miles together. There are four bridges over the Rhone before it joins the Arve; and from it the city is ſupplied with water by means of an hydraulic machine, which raiſes it 100 Paris feet above its level. The principal buildings are, 1. The maiſon de ville, or townhouſe, a plain ancient edifice, with large rooms, in which the councils aſſemble, and public entertainments are held; and in one of them a weekly concert is held by ſubſcription during the winter. The aſcent to the upper ſtory is not by ſteps but a paved acclivity: which, however, is ſo gentle, that horſes and mules can go up to the top. 2. The church of St Peter's, formerly the cathedral, is an ancient Gothic building, with a modern portico of ſeven large Corinthian columns of red and white marble from Roche. The only thing remarkable in the inſide is the tomb of Henry duke of Rohan. 3. The arſenal is in good order, and ſupplied with arms ſufficient for 12,000 men. There are many ancient ſuits of armour; and the ſcaling ladders, lanthorns, hatchets, &c. uſed by the Savoyards in their treacherous attempt on the city in the year 1602, to be afterwards noticed, are here preſerved. The magazines contain 110 cannon, beſides mortars. 4. The hoſpital is a large handſome building, by which and other charities near 4000 poor people are maintained. 5. The fortifications on the ſide of Savoy are of the modern conſtruction, but are commanded by ſome neighbouring grounds. On the ſide of France they are old faſhioned, and at any rate are rather calculated to prevent a ſurpriſe than to ſuſtain a regular ſiege. There are three gates, towards France, Savoy, and Switzerland; and the acceſs to the lake is guarded by a double jetty and chain.

The territory belonging to this city contains about ſeven ſquare leagues, and is divided into nine pariſhes; the town is by far the moſt populous in Switzerland, having about 30,000 inhabitants, of whom, however, 5000 are generally ſuppoſed to be abſent. It has a ſmall diſtrict dependent on it, but this does not contain above 16,000. The adjacent country is extremely beautiful, and has many magnificent views ariſing from the different poſitions of the numerous hills and mountains with regard to the town and lake. The inhabitants were formerly diſtinguiſhed into four claſſes, viz. citizens, burgeſſes, inhabitants, and natives; and ſince the revolution in 1782, a fifth claſs named *domicilius*, has been added, who annually receive permiſſion from the magiſtrates to reſide in the city. The citizens and burgeſſes alone, however, are admitted to a ſhare in the government; thoſe called *inhabitants* are ſtrangers allowed to ſettle in the town with certain privileges; and the *natives* are the ſons of thoſe inhabitants, who poſſeſs additional advantages. The people are very active and induſtrious, carrying on an extenſive commerce. Geneva.

1 State of learning in Geneva.

This city is remarkable for the number of learned men it has produced. The reformed doctrines of religion were very early received in it, being preached there in 1533 by William Farel and Peter Viret of Orbe, and afterwards finally eſtabliſhed by the celebrated John Calvin. Of this reformer Voltaire obſerves, that he gave his name to the religious doctrines firſt broached by others, in the ſame manner that Americus Veſputius gave name to the continent of America, which had formerly been diſcovered by Columbus. It was by the aſſiduity of this celebrated reformer, and the influence that he acquired among the citizens, that a public academy was firſt eſtabliſhed in the city, where he, Theodore Beza, and ſome of the more eminen firſt reformers, read lectures with uncommon ſucceſs. The intolerant ſpirit of Calvin is well known; but little of it now appears in the government of Geneva: on the contrary, it is the moſt tolerating of all the eſtates in Switzerland, being the only one of them which permits the public exerciſe of the Lutheran religion. The advantages of the academy at Geneva are very conſpicuous among the citizens at this day, even the lower claſs of them being exceedingly well informed; ſo that, according to Mr Coxe, there is not a city in Europe where learning is ſo generally diffuſed. "I received great ſatisfaction (ſays he) in converſing even with ſeveral tradeſmen upon topics both of literature and politics; and was aſtoniſhed to find in this claſs of men ſo uncommon a ſhare of knowledge; but the wonder ceaſes when we are told that all of them were educated at the public academy." In this ſeminary the induſtry and emulation of the ſtudents are excited by the annual diſtribution of prizes to thoſe who diſtinguiſh themſelves in each claſs. The prizes conſiſt of ſmall medals, but are conferred with ſuch ſolemnity as cannot fail to produce a ſtriking effect on the minds of youth. There is alſo a public library to which the citizens have acceſs, and which undoubtedly tends greatly to that univerſal diffuſion of learning ſo remarkable among the inhabitants. It was founded by Bonnivard, remarkable for his ſufferings in the cauſe of the liberties of his country. Having been a great antagoniſt of the dukes of Savoy, againſt whom he aſſerted the independence of Geneva, he had the misfortune at laſt to be taken priſoner, and was impriſoned for ſix years in a dungeon below the level of the lake, in the caſtle of Chillon, which ſtands on a rock in the lake, and is connected with the land by a drawbridge. In 1536 this caſtle was taken from Charles III. of Savoy by the canton of Berne, aſſiſted by the Genevans, who furniſhed a frigate (their whole naval force) to beſiege it by water. Bonnivard was now taken from his dungeon, where by conſtant walking backward and forward, his only amuſement, he had worn a hollow in the floor which conſiſted of ſolid rock. Bonnivard conſidered the hardſhips he had endured as ties which endeared him to the city, and became a principal promoter of the reformation by the mild methods of perſuaſion and inſtruction. He cloſed his benefactions by the gift of his books and manuſcripts, and bequeathing his fortune towards the eſtabliſhment and ſupport of the ſeminary. His works, which chiefly relate to the hiſtory

Geneva. history of Geneva, are ſtill preſerved with great care and reverence. The library contains 25,000 volumes, with many curious manuſcripts, of which an account has been publiſhed by the reverend M. Sennebier the librarian, who has likewiſe diſtinguiſhed himſelf by ſeveral literary works. Meſſrs Bonnet, Sauſſure, Mallet, and De Luc, are the other moſt diſtinguiſhed literary geniuſes of which Geneva can boaſt. The laſt is particularly remarkable for the perfection to which he has brought the barometer, and which is now ſo great, that very little ſeems poſſible to be done by any body elſe. His cabinet merits the attention of naturaliſts, as containing many rare and curious ſpecimens of foſſils, which ſerve to illuſtrate the theory of the globe. It may be divided into three parts: 1. Such as enable the naturaliſt to compare the petrifactions of animals and vegetables with the ſame bodies which are ſtill known to exiſt in our parts of the globe. 2. To compare theſe petrifactions of animals with the ſame bodies which are known to exiſt in different countries. 3. To conſider the petrifactions of thoſe bodies which are no longer known to exiſt. The ſecond part comprehends the ſtones under three points of view: 1. Thoſe of the primitive mountains, which contain no animal bodies; 2. Thoſe of the ſecondary mountains, which contain only marine bodies; 3. Thoſe which contain terreſtrial bodies. The third part contains the lavas and other volcanic productions; which are diſtinguiſhed into two claſſes: 1. Thoſe which come from volcanoes now actually burning; 2. Thoſe from extinguiſhed volcanoes.

2 Account of De Luc's cabinet.

3 Hiſtory and government of Geneva.

In the time of Charles the Great, the city and territory of Geneva made part of his empire; and, under his ſucceſſors, it became ſubject to the German emperors. By reaſon of the imbecility of theſe princes, however, the biſhops of Geneva acquired ſuch authority over the inhabitants, that the emperor had no other means of counterbalancing it than by augmenting the privileges of the people In theſe barbarous ages alſo the biſhops and counts had conſtant diſputes, of which the people took the advantage; and by ſiding ſometimes with one, and ſometimes with the other, they obtained an extenſion of their privileges from both. The houſe of Savoy at length purchaſed the territory, and ſucceeded the counts with additional power: againſt them therefore the biſhops and people united in order to reſiſt their encroachments; and, during this period, the government was ſtrangely complicated, by reaſon of the various pretenſions of the three parties. The counts of Savoy, however, had at laſt the addreſs to diſſolve the union between the biſhops and citizens, by procuring the epiſcopal ſee for their brothers, and even their illegitimate children; by which means their power became gradually ſo extenſive, that towards the commencement of the 16th century, Charles III. of Savoy (though the government was accounted entirely republican) obtained an almoſt abſolute authority over the people, and exerciſed it in a moſt unjuſt and arbitrary manner. Thus violent commotions took place; and the citizens became divided into two parties, one of which, viz. the patriots, were ſtyled *Eidgenoſſen* or *confederates; the* partiſans of Savoy being diſgraced by the appellation of *Mamelucs* or *ſlaves*. The true period of Genevan liberty may therefore be conſidered as commencing with the treaty concluded with Berne and Friburg in the year 1526; in conſequence of which the duke was in a ſhort time deprived of his authority, the biſhop driven from the city, and the reformed religion and a republican form of government introduced. A long war commenced with Savoy on this acconnt; but the Genevans proved an overmatch for their enemies by their own bravery and the aſſiſtance of the inhabitants of Berne. In 1584, the republic concluded a treaty with Zurich and Berne, by which it is allied to the Swiſs cantons. The houſe of Savoy made their laſt attempt againſt Geneva in 1602, when the city was treacherouſly attacked in the night time during a profound peace. Two hundred ſoldiers had ſcaled the walls, and got into the town before the alarm was given; but they were repulſed by the deſperate valour of a few citizens, who periſhed in the encounter. A petard had been faſtened to one of the gates by the Savoyards; but the gunner was killed before it could be diſcharged. The war occaſioned by this treachery was next year concluded by a ſolemn treaty, which has ever ſince been obſerved on both ſides: though the independence of Geneva was not formally acknowledged by the king of Sardinia till the year 1754. Geneva.

The reſtoration of tranquillity from without, in conſequence of the above treaty, was however ſoon followed by the flames of internal diſcord, ſo common in popular governments; ſo that during the whole of the laſt century the hiſtory of Geneva affords little more than an account of the ſtruggles betwixt the ariſtocratical and popular parties. About the beginning of the preſent century the power of the grand council was become almoſt abſolute; but in order to reſtrain its authority, an edict was procured in 1707 by the popular party, enacting, that every five years a general council of the citizens and burghers ſhould be ſummoned to deliberate upon the affairs of the republic. In conſequence of this law a general aſſembly was convened in 1712; and the very firſt act of that aſſembly was to aboliſh the edict by which they had been convened. A proceeding ſo extraordinary can ſcarcely be accounted for on the principles of popular fickleneſs and inconſtancy. Rouſſeau, in his Miſcellaneous Works, aſcribes it to the artifices of the magiſtrates, and the equivocal terms marked upon the billets then in uſe. For the queſtion being put, "Whether the opinion of the councils for aboliſhing the periodical aſſemblies ſhould paſs into a law?" the words *approbation* or *rejection*, put upon the billets by which the votes were given, might be interpreted either way. Thus, if the billet was choſen on which the word *approbation* was written, the opinion of the councils which rejected the aſſemblies was approved; and by the word *rejection*, the periodical aſſembly was rejected of courſe. Hence ſeveral of the citizens complained that they had been deceived, and that they never meant to reject the general aſſembly, but only the opinion of the councils.

In conſequence of the abolition of the general aſſemblies, the power of the ariſtocratical party was greatly augmented; till at length the inhabitants exerting themſelves with uncommon ſpirit and perſeverance, found means to limit the power of the magiſtrates, and enlarge their own rights. In 1776, as Mr Cox informs us, the government might be conſidered as a mean betwixt

Geneva.

twixt that of the ariſtocratical and popular cantons of Switzerland. The members of the ſenate, or little council of 25, enjoyed in their corporate capacity ſeveral very conſiderable prerogatives. By them half the members of the great council were named; the principal magiſtrates were ſupplied from their own body; they convoked the great and general councils, deliberating previouſly upon every queſtion which was to be brought before theſe councils. They were veſted alſo with the chief executive power, the adminiſtration of finances, and had in a certain degree the juriſdiction in civil and criminal cauſes. Moſt of the ſmaller poſts were likewiſe filled by them; and they enjoyed the ſole privilege of conferring the burgherſhip. Theſe, and other prerogatives, however, were balanced by thoſe of the great council and the privileges of the general council. The former had a right to chooſe the members of the ſenate from their own body; receiving appeals in all cauſes above a certain value, pardoning criminals, &c. beſides which they had the important privilege of approving or rejecting whatever was propoſed by the ſenate to be laid before the people.

4 Sketch of the government in 1776.

The general council or aſſembly of the people is compoſed of the citizens and burghers of the town; their number in general amounting to 1500, though uſually not more than 1200 were preſent; the remainder reſiding in foreign countries, or being otherwiſe abſent. It meets twice a-year, chooſes the principal magiſtrates, approves or rejects the laws and regulations propoſed by the other councils, impoſes taxes, contracts alliances, declares war or peace, and nominates half the members of the great council, &c. But the principal check to the power of the ſenate aroſe from the right of *re-election*, or the power of annually expelling four members from the ſenate at the nomination of the *ſyndics* or principal magiſtrates, and from the right of repreſentation. The ſyndics are four in number, choſen annually from the ſenate by the general council; and three years elapſe before the ſame members can be again appointed. In chooſing theſe magiſtrates, the ſenate appointed from its own body eight candidates, from whom the four ſyndics were to be choſen by the general council. The latter, however, had it in their power to reject not only the firſt eight candidates, but alſo the whole body of ſenators in ſucceſſion: in which caſe, four members of the ſenate retired into the great council: and their places were filled by an equal number from that council. With regard to the power of repreſentation, every citizen or burgher has the privilege of applying to the ſenate in order to procure a new regulation in this reſpect, or of remonſtrating againſt any act of the magiſtracy. To theſe remonſtrances the magiſtrates were obliged to give an explicit anſwer; for if a ſatisfactory anſwer was not given to one, a ſecond was immediately preſented. The repreſentation was made by a greater or ſmaller number of citizens according to the importance of the point in queſtion.

5 Account of the revolution in 1782.

Since 1776, however, ſeveral changes have taken place. This right of *re-election*, which the ariſtocratical party were obliged to yield to the people in 1768, ſoon proved very diſagreeable, being conſidered by the former as a kind of oſtraciſm; for which reaſon they catched at every opportunity of procuring its abolition. They were now diſtinguiſhed by the title of *negatives*, while the popular party had that of *repreſentants*; and the point in diſpute was the compilation of a new code of laws. This meaſure the negatives oppoſed, as ſuppoſing that it would tend to reduce their prerogatives; while, on the other hand, the repreſentants uſed their utmoſt endeavours to promote it, in hopes of having their privileges augmented by this means. At laſt in the month of January 1777, the negatives were obliged to comply with the demands of their antagoniſts; and a committee for forming a new code of laws was appointed by the concurrence of the little, great, and general councils. The committee was to laſt for two years, and the code to be laid before the three councils for their joint approbation or rejection. A ſketch of the firſt part of the code was preſented to the little and great councils on the firſt of September 1779, that they might profit by their obſervations before it was preſented to the general council. Great diſputes aroſe; and at length it was carried by the negatives that the code ſhould be rejected and the committee diſſolved. The oppoſite party complained of this as unconſtitutional, and violent diſputes enſued; the iſſue of which was, that the great council offered to compile the code, and ſubmit it to the deciſion of the public. This did not give ſatisfaction to the popular party, who conſidered it as inſidious: the contentions revived with more fury than ever, until at length the negatives ſuppoſing, or pretending to ſuppoſe, that their country was in danger, applied to the guarantees, France, Zurich, and Berne, entreating them to protect the laws and conſtitution. This was productive of no good effect; ſo that the negatives found no other method of gaining their point than by ſowing diſſenſion among the different claſſes of inhabitants. The *natives* were diſcontented and jealous on account of many excluſive privileges enjoyed by that claſs named *citizens*: they were beſides exaſperated againſt them for having, in 1770, baniſhed eight of the principal natives, who pretended that the right of burgherſhip belonged to the natives as well as to the citizens, and demanded that this right ought to be gratuitouſly conferred inſtead of being purchaſed. The negatives, in hopes of making ſuch a conſiderable addition to their party, courted the natives by all the methods they could think of, promiſing by a public declaration that they were ready to confer upon them thoſe privileges of trade and commerce which had hitherto been confined excluſively to the citizens. The deſigns of the negatives were likewiſe openly favoured by the court of France, and diſpatches were even written to the French reſident at Geneva to be communicated to the principal natives who ſided with the ariſtocratic party. The attorney-general, conceiving this mode of interference to be highly unconſtitutional, preſented a ſpirited remonſtrance; by which the French court were ſo much diſpleaſed, that they procured his depoſition from his office; and thus their party was very conſiderably increaſed among the natives. The repreſentants were by no means negligent in their endeavours to conciliate the favour of the ſame party, and even promiſed what they had hitherto oppoſed in the ſtrongeſt manner, viz. to facilitate the acquiſition of the burgherſhip, and to beſtow it as the recompenſe of induſtry and good behaviour. Thus two parties were formed among the natives themſelves; and the diſſenſions becoming

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Geneva. coming every day worſe and worſe, a general inſurrection took place on the 5th of February 1781. A diſpute, accompanied with violent reproaches, having commenced betwixt two neighbouring and oppoſite parties of natives, a battle would have immediately taken place, had it not been for the interpoſition of the ſyndics on the one ſide, and the chiefs of the repreſentants on the other. The tumult was beginning to ſubſide, when a diſcharge of muſquetry was heard from the arſenal. Some young men who ſided with the negatives, having taken poſſeſſion of the arſenal, had fired by miſtake upon ſeveral natives of their own party, and had killed one and wounded another. This was conſidered by the repreſentants as the ſignal for a general inſurrection, on which they inſtantly took up arms and marched in three columns to the arſenal; but finding there only a few young men who had raſhly fired without orders, they permitted the reſt to retire without moleſtation. In the opinion of ſome people, however, this affair was preconcerted, and the repreſentants are ſaid to have been the firſt aggreſſors.

The repreſentants having thus taken up arms, were in no haſte to lay them down. They took poſſeſſion of all the avenues to the city; and their committee being ſummoned next morning by the natives to fulfil their engagements with reſpect to the burgherſhip, they held ſeveral meetings with the principal negatives on that ſubject, but without any ſucceſs: for though the latter readily agreed to an augmentation of the commercial privileges of the natives, they abſolutely refuſed to facilitate the acquiſition of the burgherſhip. The committee, however, embarraſſed and alarmed at the number and threats of the natives, determined to abide by what they had promiſed; drew up an edict permitting the natives to carry on trade, and to hold the rank of officers in the military aſſociations; and conferred the burgherſhip on more than 100 perſons taken from the natives and inhabitants, and even from the peaſants of the territory. This was approved by the three councils; the negatives, dreading the power of their adverſaries, who had made themſelves maſters of the city, not daring to make their appearance.

Thus the popular party imagined that they had got a complete victory; but they ſoon found themſelves deceived. They were prevailed upon by the deputies from Zurich and Berne (who had been ſent to conciliate the differences) to lay down their arms; and this was no ſooner done, than the ſame deputies declared the edict in favour of the natives to be null and illegal. The ſenate declared themſelves of the ſame opinion; and maintained, that the aſſent of the councils had been obtained only through fear of the repreſentants who were under arms, and whom none at that time durſt oppoſe. The repreſentants, exaſperated by this proceeding, preſented another remonſtrance on the 18th of March 1782, ſummoning the magiſtrates once more to confirm the edict; but a month afterwards received the laconic anſwer, that "government was neither willing nor able to confirm it." The natives, now finding themſelves diſappointed in their favourite object at the very time they had ſuch ſtrong hopes of obtaining it, behaved at firſt like frantic people; and theſe tranſports having ſubſided, an univerſal tumult took place. The moſt moderate of the popular party endeavoured in vain to allay their fury, by diſperſing themſelves in different quarters of the city; and the citizens, finding themſelves at laſt obliged either to abandon the party of the natives or to join them openly, haſtily adopted the latter meaſure; after which, as none could now oppoſe them, the officers of the repreſentants took poſſeſſion of the town, and quelled the inſurrection. Various negotiations were carried on with the negatives in order to prevail upon them to ratify the edict, but without ſucceſs: on which a few of the magiſtrates were confined by the popular party along with the principal negatives; and as they juſtly expected the interference of France on account of what they had done, they reſolved to prolong the confinement of the priſoners, that they might anſwer the purpoſe of hoſtages for their own ſafety. In the mean time the body of citizens, deceived by the pretences of the popular party, acted as if their power was already eſtabliſhed and permanent. In conſequence of this, they depoſed ſeveral members of the great and little councils, appointing in their room an equal number of perſons who were favourable to the cauſe of the repreſentants. The great council thus new modelled, executed the edict for conferring the burgherſhip upon a number of the natives; and appointed a committee of ſafety, compoſed of eleven members, with very conſiderable authority. By this committee the public tranquillity was re-eſtabliſhed; after which, the fortifications were ordered to be repaired; and the people were buoyed up by the moſt dangerous notions of their own proweſs, and a confidence that France either durſt not attack them or did not incline to do ſo. In conſequence of this fatal error, they refuſed every offer of reconciliation which was made them from the other party; until at laſt troops were diſpatched againſt them by the king of Sardinia and the canton of Berne; and their reſpective generals, Meſſrs de la Marmora and Lentulus, were ordered to act in concert with the French commander, M. de Jaucourt, who had advanced to the frontiers with a conſiderable detachment. The Genevans, however, vainly puffed up by a confidence in their own abilities, continued to repair their fortifications with indefatigable labour; the peaſants repaired from all quarters to the city, offering to mount guard and work at the fortifications without any pay; women of all ranks crowded to the walls as to a place of amuſement, encouraging the men, and even aſſiſting them in their labour. The beſiegers, however, advanced in ſuch force, that every perſon of diſcernment foreſaw that all reſiſtance would be vain. The French general Jaucourt, on the 29th of June 1782, deſpatched a meſſage to the ſyndics; in which he inſiſted on the following humiliating conditions: 1. That no perſon ſhould appear on the ſtreets under pain of military puniſhment. 2. That a certain number of citizens, among whom were all the chiefs of the repreſentants, ſhould quit the place in 24 hours. 3. That all arms ſhould be delivered to the three generals. 4. That the depoſed magiſtrates ſhould be inſtantly re-eſtabliſhed: And, laſtly, That an anſwer ſhould be returned in two hours. By this meſſage the people were thrown into the utmoſt deſpair; and all without exception reſolved to periſh rather than to accept of terms ſo very diſgraceful. They inſtantly hurried to the ramparts with a view of putting their reſolution

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Geneva. in force; but in the mean time the ſyndics found means to obtain from the generals a delay of 24 hours. During this interval, not only men of all ages prepared for the approaching danger, but even women and children tore the pavement from the ſtreets, carrying the ſtones up to the tops of the houſes, with a view of rolling them down upon the enemy in caſe they ſhould force their way into the town. About 80 women and girls, dreſſed in uniforms, offered to form themſelves into a company for the defence of their country. The committee of ſafety accepted their ſervices, and placed them in a barrack ſecured from the cannon of the beſiegers. The negatives were greatly alarmed at this appearance of deſperate reſiſtance; and ſome of the moſt moderate among them endeavoured, but without ſucceſs, to effect a reconciliation. At the hour in which it was expected that the attack would begin, the ramparts were filled with defenders; and though the moſt zealous of the popular party had calculated only on 3000, upwards of 5000 appeared in the public cauſe. The French general, however, juſtly alarmed for the priſoners, who were now in imminent danger, again prolonged the period propoſed for the capitulation. By theſe repeated delays the ardour of the defendants began to abate. The women firſt began to figure to themſelves the horrors of a town taken by aſſault, and given up to an enraged and licentious ſoldiery; many timid perſons found means not only to diſguiſe their own fears, but to inſpire others with them under the pretence of prudence and caution: at laſt the committee of ſafety themſelves, who had ſo ſtrenuouſly declared for hoſtilities, entirely changed their mind. Being well apprized, however, that it would be dangerous for them to propoſe ſurrendering in the preſent temper of the people, they aſſembled the citizens in their reſpective circles, repreſenting, that if the city ſhould be attacked in the night, it would be no longer poſſible to convene them: for which reaſon they recommended to them that each circle ſhould nominate ſeveral deputies with full authority to decide in their ſtead; adding, that they ought rather to appoint thoſe perſons who from their age and reſpectable character were capable of aſſiſting their country by their advice, while others were defending it by their valour. Thus a new council, compoſed of about 100 citizens, was formed; in which the chiefs, by various manœuvres, firſt intimidating, and then endeavouring to perſuade the members of the neceſſity of ſurrendering, at laſt found means to take the thoughts of the people entirely off the defence of the city, and engage them in a ſcheme of general emigration. A declaration was drawn up to be delivered to the ſyndics with the keys of the city, the chiefs ſummoned the principal officers from their poſts, ordered the cannon of ſeveral batteries to be rendered unfit for ſervice, and at laſt took care of themſelves by quitting the town. The people were in the utmoſt deſpair; and left the town in ſuch multitudes, that when the Sardinians entered it in the morning, they found it almoſt deſerted. This was followed by the reſtoration of the former magiſtrates, a complete ſubjection of the popular party, and the eſtabliſhment of a military government.

6 New conſtitution eſtabliſhed. The changes which took place on this occaſion were as follow: 1. An abolition of the right of re-election. 2. The abolition of that right by which the general council nominated half the vacancies in the great council. 3. The right of remonſtrating was taken from the citizens at large, and veſted in 36 adjuncts, who might be preſent in the great council the firſt Monday of every month. They enjoyed a right of repreſentation, and in conſequence of that had a deliberative voice; but on the whole were ſo inſignificant, that they were nicknamed *Les Images*, or "The ſhadows." 4. The introduction of the grabeau, or annual confirmation of the members of the ſenate and of the great council, veſted entirely in the latter. By this law part of the authority both of the ſenate and general council was transferred to the great council; and by ſubjecting the ſenate to this annual reviſion, its power was greatly leſſened, and it was made in fact dependent upon the general councils. 5. The circles or clubs in which it was cuſtomary to convene the citizens, and all public aſſemblies whatever, were prohibited; and ſo rigorouſly was this carried into execution, that the ſociety of arts was prohibited from meeting. 6. The militia were aboliſhed; firing at marks, even with bows and arrows, was prohibited; and the town, inſtead of being guarded by the citizens, was now put under the care of 1000 foreign ſoldiers, whoſe colonel and major were both to be foreigners. Theſe troops were to take an oath of fidelity to the republic, and of obedience to the great council and the committee of war: but were under the immediate command and inſpection of the latter, and ſubject to the ſuperior controul of the former. 7. No perſon was permitted to bear arms, whether citizen, native, or inhabitant. 8. Several taxes were impoſed without the conſent of the general council; but in time to come it was provided, that every change or augmentation of the revenue ſhould be ſubmitted to that body. 9. Several privileges with regard to trade and commerce, formerly poſſeſſed by the citizens alone, were now granted both to citizens and inhabitants.

It is not to be ſuppoſed that this revolution would be agreeable to people who had ſuch a ſtrong ſenſe of liberty, and had been accuſtomed to put ſuch a value upon it, as the Genevans. From what has been already related, it might ſeem reaſonable to conclude, that an almoſt univerſal emigration would have taken place: but after their reſentment had time to ſubſide, moſt of thoſe who fled at firſt, thought proper to return; and, in the opinion of Mr Coxe, not more than 600 finally left their country on account of the revolution in 1782. The emigrants principally ſettled at Bruſſels and Conſtance, where they introduced the arts of printing linens and watchmaking. Soon after the revolution, indeed, a memorial, ſigned by above 1000 perſons of both ſexes, all of them either poſſeſſed of ſome property or verſed in trade or manufactures, was preſented to the earl of Temple, then lord lieutenant of Ireland, expreſſing a deſire to ſettle in that kingdom. The propoſal met with general approbation; the Iriſh parliament voted 50,000l. towards defraying the expences of their journey, and affording them a proper ſettlement in the iſland. Lands were purchaſed for 8000l. in a convenient ſituation near Waterford; part of New Geneva was actually completed at the expence of 10,000l.; a charter was granted with very conſiderable privileges; the ſtandard of gold was alter-

7 Scheme of ſettling a number of Genevans in Ireland.

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Geneva. ed for the accommodation of the watch manufacturers; and the foundation of an academy laid upon an uſeful and liberal plan. Seven Genevans landed in Ireland in the month of July 1783: but when the nation had expended near 30,000l. on the ſcheme, it was ſuddenly abandoned. This ſeems principally to have been owing to the delays neceſſarily occaſioned in the execution of ſuch a complicated plan; and in ſome degree alſo by the high demands of the Genevan commiſſioners, who required many privileges inconſiſtent with the laws of Ireland. By theſe delays the Genevans, whoſe character ſeems not to be *perſeverance*, were induced to abandon the ſcheme, and return to their former place of reſidence. Even the few who had already landed, though maintained at the public expence, were diſcontented at not finding the new town prepared for their reception; and as thoſe among the propoſed emigrants who poſſeſſed the greateſt ſhare of property had already withdrawn their names, the remainder did not chooſe to remain in a country where they had not capital ſufficient to carry on any conſiderable trade or manufacture. A petition was then preſented by the Genevan commiſſioners, requeſting that 10,000l. of the 50,000l. voted might be appropriated to the forming a capital: but as this had been voted for other purpoſes, the petition was of courſe rejected; in conſequence of which, the Genevans relinquiſhed the ſettlement by an addreſs, and ſoon after quitted the iſland.

8 New revolution in 1789.

The people of Old Geneva, though returned to their former place of abode, were far from being inclined to ſubmit to the yoke with patience. They were obliged to pay heavy taxes for maintaining a military force expreſsly calculated to keep themſelves in ſubjection: and ſo intolerable did this appear, that in a few years every thing ſeemed ready for another revolution. The ſucceſs of this ſeemed more probable than that of the former, as France was not now in a condition to interfere as formerly. The general ferment ſoon roſe to ſuch a height, that government was obliged to call in the aid of the military to quell a tumult which happened in the theatre. This produced only a temporary tranquillity; another tumult took place on the 26th of January 1789, on account of the publication of an edict raiſing the price of bread a farthing per pound. On this the people inſtantly roſe, plundered the bakers ſhops: and next day a carriage loaded with bread and eſcorted by ſoldiers was plundered in its way to the diſtribution office. The ſoldiers fired on the populace, by which one man was killed and another wounded: but the tumult ſtill increaſing, the ſoldiers were driven away; and the body of the deceaſed was carried in a kind of proceſſion before the town houſe, as a monument of the violence and oppreſſion of the ariſtocratic party. The magiſtrates in the mean time ſpent their time in deliberation, inſtead of taking any effectual method of quelling the inſurrection. The people made the beſt uſe of the time afforded them by this delay of the magiſtrates; they attacked and carried two of the gates, dangerouſly wounding the commanding officer as he attempted to allay the fury of both parties. At laſt the magiſtrates deſpatched againſt them a conſiderable body of troops, whom they thought the inſurgents would not have the courage to reſiſt; but in this they found themſelves deceived. The people had formed a ſtrong barricade, behind which they played off two fire pumps filled with boiling water and ſoap lyes againſt the extremities of two bridges which the military had to croſs before they could attack them. The commanding officer was killed and ſeveral of his men wounded by the diſcharge of ſmall arms from windows; and the pavement was carried up to the tops of houſes in order to be thrown down upon the troops if they ſhould force the barricades and penetrate into the ſtreets. The tumult in the mean time continued to increaſe, and was in danger of becoming univerſal; when the magiſtrates, finding it would be impoſſible to quell the inſurgents without a great effuſion of blood, were reduced to the neceſſity of complying with their demands. One of the principal magiſtrates repaired in perſon to the quarter of St Gervais, proclaimed an edict for lowering the price of bread, granted a general amneſty, and releaſed all the inſurgents who had been taken into cuſtody. Thus a momentary calm was produced; but the leaders of the inſurrection, ſenſible that the magiſtrates were either unable or unwilling to employ a ſufficient force againſt them, reſolved to take advantage of the preſent opportunity to procure a new change of government. A new inſurrection, therefore, took place on the 29th of the month, in which the ſoldiers were driven from their poſts, diſarmed, and the gates ſeized by the people. The magiſtrates then, convinced that all oppoſition was fruitleſs, determined to comply with the demands of their antagoniſts in their full extent; and the ariſtocratical party ſuddenly changing their ſentiments, renounced in a moment that ſyſtem to which they had hitherto ſo obſtinately adhered. On the application of the ſolicitor general, therefore, for the recovery of the ancient liberties of the people, the permiſſion of bearing arms, re-eſtabliſhment of the militia, and of their circles or political clubs, the removal of the garriſon from the barracks, and the recal of the repreſentants who were baniſhed in 1782; theſe moderate demands were received with complacency, and even ſatisfaction. The preliminaries were ſettled without difficulty, and a new edict of pacification was publiſhed under the title of *Modifications à l'Edition de* 1782, and approved by the ſenate, great council, and general council. So great was the unanimity on this occaſion, that the modifications were received by a majority of 1321 againſt 52. The pacification was inſtantly followed by marks of friendſhip betwixt the two parties which had never been experienced before; the ſons of the principal negatives frequented the circles of the burghers; the magiſtrates obtained the confidence of the people; and no monument of the military force ſo odious to the people will be allowed to remain. "The barracks of the town houſe (ſays Mr Coxe) are already evacuated, and will be converted into a public library; the new barracks, built at an enormous expence, and more calculated for the garriſon of a powerful and deſpotic kingdom than for a ſmall and free commonwealth, will be converted into a building for the univerſity. The reformation of the ſtudies, which have ſcarcely received any alteration ſince the time of Calvin, is now in agitation. In a word, all things ſeem at preſent to conſpire for the general good; and it is to be hoped that both parties, ſhocked at the recollection of paſt troubles, will continue on as friendly

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Geneva, as well as the whole of Switzerland, fell a victim to French rapacity in 1802. The following obſervations, made by a traveller on the ſpot, afford us ſome information of the conſequences of this event to Geneva, of its degraded ſtate, and of the manners of the inhabitants,

"The population of Geneva is about 24,000: moreover it contains at preſent between 1200 and 1400 French troops: the parties intermix but little, and have had no diſputes, although they certainly regard each other with an eye of jealouſy. The Genevans do the French ſoldiers the juſtice to ſay, that they have demeaned themſelves in a very becoming manner during their reſidence here: they acknowledge themſelves to be a conquered people, and dare not open their mouths, except to an Engliſhman, againſt the treacherous invaders of their country, and deſtroyers of their liberties.

"You are too well verſed in the hiſtory of this people to require being told, that, notwithſtanding their preſent humiliated condition, Freedom is the goddeſs they worſhip; and that, had there been any poſſibility of ſecuring her from violation, they would gladly have bled before her altars. However various has been their ſucceſs, in the different revolutions which have agitated this ſecluded ſtate, the Genevans have uniformly evinced a courage which awed their enemies, and a determined bravery in defence of their rights, which in ſhewing that they prized them highly, gave proof that they were worthy to enjoy them.

"The territory of Geneva is comprehended in the *Department du Leman*, which department contains about 16 ſquare leagues of land: its population is eſtimated at 609,000 perſons. It is divided into three cantons or hundreds, the largeſt of which has Geneva for its capital, and contains about 75,000 ſouls, of which 10,000 only are Genevans, 20,000 are French, and the remainder are Savoyards. The prefet, as in all the other departments, is appointed by the Firſt Conſul, *durante beneplacito*. The care of the high roads and public walks, public finances, executive juſtice, military affairs, and paſſports, are under his immediate direction. All military appointments are given to Frenchmen: one general commands the town, and another the country. At the firſt moment of the revolution all the old magiſtrates were diſplaced, and ſince that time the civil officers have been elected by the citizens at large, conſequently ſome are Frenchmen, and ſome Genevans: the preſent mayor is one of the latter: he is a gentleman of great reſpectability, and is much eſteemed by both parties. Whenever a new code of laws ſhall be eſtabliſhed in France, its operations will be extended over the territory of Geneva; but at preſent the people here retain their old laws with ſome trifling alterations only, rather the form than the ſubſtance: thus, the guillotine is now ſubſtituted for the gallows, and the puniſhments in general, without varying the degree, are inflicted according to the French manner.

"In their treaty with France, the Genevans ſtipulated, that their hoſpital ſhould not be obliged to receive French ſoldiers: this hoſpital was founded in the early part of the laſt century, by ſome of the richeſt citizens, and is ſo well ſupported by legacies, and by annual ſubſcriptions, that the fund enables the directors to expend two thouſand louis a year. In contempt of his treaty, Bonaparte has inſiſted on the admiſſion of French ſoldiers, for whoſe accommodation, however, he promiſed to pay a certain ſum *per diem*: in contempt of his promiſe, again, he has withheld the payment! An hoſpital, however, is now preparing at Carouge, a village in Savoy, between Geneva and Grange Colonge, for Frenchmen, to which, it is expected, the ſoldiers will be removed in May or June. Here is alſo a general hoſpital, once the nunnery of St Clair; it was founded, together with many other uſeful inſtitutions, by that celebrated reformer, John Calvin, who fled from the perſecution of Francis I. and found an aſylum in Geneva. The revenue ariſing from the eſtates of this hoſpital has, till within theſe laſt few years, been commenſurate with its expences: but, for ſome time back, it has been found neceſſary to collect almoſt an additional fourth, in order to ſupply its diſburſements: twice in the year the treaſurer goes round to every houſe, and ſolicits the charitable contribution of its inmates. Geneva.

"Prior to the laſt revolution, I learn, that 600,000 French livres diſcharged all the public expences: with this very trifling ſum were paid the ſalaries of the magiſtrates, of the maſter of the town, of the maſter of the country, the expences of the academy, of repairing the roads, of cleaning and lighting the town; in ſhort, theſe 600,000 livres were ſufficient to defray all the ordinary expences of the government. Since that too-memorable event, the citizens of Geneva have been aſſeſſed to the amount of 1,500,000 livres, the ſalaries of the inferior magiſtrates are in arrears, the roads are not kept in good repair, the town is very dimly lighted, and the ſtreets, a few of the principal ones excepted, are left with all their dirty honours thick upon them! The inhabitants go ſo far as to aſſert, that, in conſequence of the neglect which the public drains have ſuffered, they have been affected with fevers and other illneſſes to which they had hitherto been ſtrangers.

"I underſtand, that the revenue of Geneva, ſince it has been annexed to the republic of France, ariſes chiefly from the following ſources.—An exciſe duty is laid on all proviſions (wheat excepted), on wine and merchandiſe of every deſcription, which is brought into Geneva: the annual produce of this tax is about 120,000 French livres; a land tax; a tax on doors and windows; a tax on the ſale of eſtates; a heavy tax on the collateral inheritance of an eſtate—where the inheritance is lineal and immediate, the tax is moderate. To theſe taxes or contributions, as they are called, muſt be added *la contribution mobilière*, which is a ſmall tax on perſonal property, and produces annually about 75,000 livres. The collectors of theſe taxes are appointed by the Firſt Conſul, and are paid very highly for their trouble: the prefet, and all the principal public officers, are very regularly paid, but thoſe in a ſubordinate ſituation ſeldom get above one-third of their ſtipends.

"Divorces ſeem to be obtained here with too much facility. But, in the firſt place, as to marriages, they muſt be celebrated, according to the French law, before the municipality, at the maiſon de ville. Marriage in France, you know, is merely a civil ceremony, the parties being obliged to ſwear before an appointed magiſtrate, that they are of age, and that they have conſented

Geneva. consented to become man and wife. The Genevans, however, do not consider this ceremony as sufficient: but, as our Gretna Green couples, on their return to Britain, think it necessary, after the fervour of passion is abated, and the mercury is fallen, in the animal thermometer, something lower than *blood heat*, to have the holy rites performed with the solemnity prescribed by law; so the Genevans, in addition to the civil ceremony prescribed by the laws of the republic of France, voluntarily conform to the religious ordinance of their own church. That a man should be able to obtain a divorce from the wife who is unfaithful to his bed, is highly reasonable; but here, if a woman leaves her husband, and refuses to return to his habitation, after being summoned by him for that purpose, he can repudiate her for disobedience. This doubtless was grounded on the presumption, that, if a woman fled from her husband, and resisted his solicitation to return, it could only be for the purpose of cohabiting with some other man: but an advantage is taken of this presumption; and now, when the parties, for whatever reasons, are desirous of being divorced, the wife, with the knowledge and consent of her husband, generally goes into Switzerland, where she remains six months, during which time the husband summons her to return, she refuses, and at the end of that term a divorce is declared between them *."

* *Month. Mag.* 1802.

GENEVA Lake. This lake is in the shape of a crescent; along the concave side of which Mr Coxe travelled 54 miles. Switzerland forms the hollow, and Savoy the convex part; the greatest breadth being about 12 miles. The country on the side of Savoy is full of high and craggy mountains; but from Geneva to the environs of Lausanne it slopes to the margin of the lake, and is very rich and fertile. The banks rise considerably in the neighbourhood of Lausanne, and form a most beautiful terrace, with a rapid descent a few miles beyond the town. A plain begins in the neighbourhood of Vevay, which continues for a great way beyond the end of the lake, but contracting towards the water by the approach of the mountains. The lake itself appears at a distance of a beautiful blue colour, and the water is very clear and transparent. Near Geneva the coast of the lake abounds with pebbles; between that city and Lausanne it is sandy; from thence to Chilon it is bounded by hard calcareous rocks; and the extremity of the shores is a marsh formed by mud collected from the river Rhone. The greatest depth of this lake found by M. de Luc is 160 fathoms. Here the birds called *tippet grebes* make their appearance in December, and retire in February to other places where they breed. They make floating nests of reeds; but as the lake of Geneva affords none of these, they are obliged to migrate to other places where they grow. Their skins are much esteemed, and sell for 12s. or 14s. each. The lake of Geneva, like all others situated between mountains, is subject to sudden storms.

GENEVA, or *Gin*, among distillers, an ordinary malt spirit, distilled a second time, with the addition of some juniper berries.

Originally, the berries were added to the malt in the grinding; so that the spirit thus obtained was flavoured with the berries from the first, and exceeded all that could be made by any other method. At present, they leave out the berries entirely, and give their spirits a flavour by distilling them with a proper quantity of oil of turpentine; which though it nearly resembles the flavour of juniper berries, has none of their valuable virtues. Geneva || Genii.

GENEVIEVE, fathers or religious of; the name of a congregation of regular canons of the order of St Augustine, established in France.

The congregation of St Genevieve is a reform of the Augustine canons. It was begun by St Charles Faure, in the abbey of St Vincent de Senlis, of which he was a member, in the year 1618.

In the year 1634, the abbey was made elective; and a general chapter, composed of the superiors of 15 houses who had now received the reform, chose F. Faure coadjutor of the abbey of St Genevieve, and general of the whole congregation. Such were its beginnings.

It has since increased very much, and it now consists of above a hundred monasteries; in some whereof the religious are employed in the administration of the parishes and hospitals: and in others, in the celebration of divine service, and the instruction of ecclesiastics in seminaries for the purpose.

The congregation takes its name from the abbey of St Genevieve, which is the chief of the order, and whose abbot is the general thereof. The abbey itself took its name from St Genevieve, the patroness of the city of Paris, who died in the year 512. Five years after her death, Clovis erected the church of St Genevieve, under the name and invocation of St Peter, where her relicks are still, or were till lately preserved, her shrine visited, and her image carried with great processions and ceremonies upon extraordinary occasions, as when some great favour is to be entreated of heaven.

GENGIS KHAN, the renowned sovereign of the Moguls, a barbarous and bloody conqueror. See JENGHIZ KHAN, and (*History* of the) MOGULS.

GENIAL, an epithet given by the Pagans to certains gods who were supposed to preside over generation.

The genial gods, says Festus, were earth, air, fire, and water. The twelve signs, together with the sun and moon, were sometimes also ranked in the number.

GENII, a sort of intermediate beings, by the Mahometans believed to exist, between men and angels. They are of a grosser fabric than the latter, but much more active and powerful than the former. Some of them are good, others bad, and they are capable of future salvation or damnation like men. The orientals pretend that these genii inhabited the world many thousand years before the creation of Adam, under the reigns of several princes, who all bore the common name of Solomon; that falling at length into an almost general corruption, Eblis was sent to drive them into a remote part of the earth, there to be confined; and that some of that generation still remaining were by Tahmurath, one of the ancient kings of Persia, forced to retreat into the famous mountain of *Kaf*; of whose successions and wars they have many fabulous and romantic stories. They also made several ranks and degrees among this kind of beings (if they are not rather

different

Genii ‖ Genius.

different ſpecies); ſome being abſolutely called *Jin*; ſome *Peri*, or fairies; ſome *Div*, or giants; and others *Tacwins*, or fates.

GENIOGLOSSI, in *Anatomy*. See ANATOMY, *Table of the Muſcles*.

GENIOHYOIDÆUS, in *Anatomy*. *Ibid.*

GENIOSTOMA, a genus of plants belonging to the pentandria claſs. See BOTANY *Index*.

GENIPPA, a genus of plants, belonging to the pentandria claſs, and in the natural method ranking under the 30th order, *Contortæ*. See BOTANY *Index*.

GENISTA, BROOM, or DYERS WEED, a genus of plants belonging to the diadelphia claſs; and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY *Index*.

GENITAL, an appellation given to whatever belongs to the parts of generation. See ANATOMY, N° 107, 108.

GENITES, among the Hebrews, thoſe deſcended from Abraham, without any mixture of foreign blood.

The Greeks diſtinguiſhed by the name of *genites* ſuch of the Jews as were iſſued from parents, who, during the Babyloniſh captivity, had not allied with any gentile family.

GENITIVE, in *Grammar*, the ſecond caſe of the declenſion of nouns. The relation of one thing conſidered as belonging in ſome manner to another, has occaſioned a peculiar termination of nouns called the *genitive caſe*; but in the vulgar tongues they make uſe of a ſign to expreſs the relation of this caſe. In Engliſh they prefix the particle *of*, in French *de* or *du*, &c. Though in ſtrictneſs there are no caſes in either of theſe languages; inaſmuch as they do not expreſs the different relations of things by different terminations, but by additional prepoſitions, which is otherwiſe in the Latin.

GENIUS, a good or evil ſpirit or dæmon, whom the ancients ſuppoſed ſet over each perſon, to direct his birth, accompany him in life, and to be his guard. See DÆMON.

Among the Romans, Feſtus obſerves, the name *genius* was given to the god who had the power of doing all things, *deum qui vim obtineret rerum omnium gerendarum*; which Voſſius, *de Idol.* rather chooſes to read *genendarum*, who has the power of producing all things; by reaſon Cenſorinus frequently uſes *gerere* for *gignere*.

Accordingly St Auguſtin, *de Civitate Dei*, relates, from Varro, that the Genius was a god who had the power of generating all things; and preſided over them when produced.

Feſtus adds, that Aufuſtius ſpake of the genius as the Son of God, and the Father of men, who gave them life; others, however, repreſented the genius as the peculiar or tutelary god of each place; and it is certain, the laſt is the moſt uſual meaning of the word. The ancients had their *genii* of nations, of cities, of provinces, &c. Nothing is more common than the following inſcription on medals, GENIUS POPULI ROM. "the genius of the Roman people;" or GENIO POP. ROM. "to the genius of the Roman people. In this ſenſe *genius* and *lar* were the ſame thing; as, in effect, Cenſorinus and Apulius affirm they were. See LARES and PENATES.

Genius.

The Platoniſts, and other eaſtern philoſophers, ſuppoſed the *genii* to inhabit the vaſt region or extent of air between earth and heaven. They were a ſort of intermediate powers, who did the office of mediators between gods and men. They were the interpreters and agents of the gods; communicated the wills of the deities to men; and the prayers and vows of men to the gods. As it was unbecoming the majeſty of the gods to enter into ſuch trifling concerns, this became the lot of the *genii*, whoſe nature was a mean between the two; who derived immortality from the one, and paſſions from the other; and who had a body framed of an aerial matter. Moſt of the philoſophers, however, held, that the genii of particular men were born with them, and died; and Plutarch attributes the ceaſing of oracles partly to the death of the genii.—See ORACLE.

The heathens, who conſidered the genii as the guardians of particular perſons, believed that they rejoiced and were afflicted at all the good and ill fortune that befel their wards. They never, or very rarely, appeared to them; and then only in favour of ſome perſon of extraordinary virtue or dignity. They likewiſe held a great difference between the genii of different men; and that ſome were much more powerful than others: on which principle it was, that a wizzard in *Appian* bids Antony keep at a diſtance from Octavius, by reaſon Antony's genius was inferior to and ſtood in awe of that of Octavius. There were alſo evil genii, who took a pleaſure in perſecuting men, and bringing them evil tidings: ſuch was that mentioned by Plutarch which appeared to Brutus the night before the battle of Philippi. Theſe were alſo called *larvæ* and *lemures*. See LARVÆ and LEMURES.

GENIUS, in matters of literature, &c. a natural talent or diſpoſition to do one thing more than another; or the aptitude a man has received from nature to perform well and eaſily that which others can do but indifferently and with a great deal of pains.

To know the bent of nature is the moſt important concern. Men come into the world with a genius determined not only to a certain art, but to certain parts of that art, in which alone they are capable of ſucceſs. If they quit their ſphere, they fall even below mediocrity in their profeſſion. Art and induſtry add much to natural endowments, but cannot ſupply them where they are wanting. Every thing depends on genius. A painter often pleaſes without obſerving rules; whilſt another diſpleaſes though he obſerves them, becauſe he has not the happineſs of being born with a genius for painting.

A man born with a genius for commanding an army, and capable of becoming a great general by the help of experience, is one whoſe organical conformation is ſuch, that his valour is no obſtruction to his preſence of mind, and his preſence of mind makes no abatement of his valour. Such a diſpoſition of mind cannot be acquired by art: it can be poſſeſſed only by a perſon who has brought it with him into the world. What has been ſaid of theſe two arts may be equally applied to all other profeſſions. The adminiſtration of great concerns, the art of putting people to thoſe employments for which they are naturally formed, the ſtudy of phyſic, and even gaming itſelf, all require a genius. Nature has thought fit to make a diſtribution of her talents

Genius, Genoa.

talents among men, in order to render them neceſſary to one another; the wants of men being the very firſt link of ſociety: ſhe has therefore pitched upon particular perſons, to give them aptitude to perform rightly ſome things which ſhe has rendered impoſſible to others; and the latter have a greater facility granted them for other things, which facility has been refuſed to the former. Nature indeed has made an unequal diſtribution of her bleſſings among her children; yet ſhe has diſinherited none; and a man diveſted of all kinds of abilities, is as great a phenomenon as an univerſal genius.

From the diverſity of genius the difference of inclination ariſes in men, whom nature has had the precaution of leading to the employments for which ſhe deſigns them, with more or leſs impetuoſity in proportion to the greater or leſſer number of obſtacles they have to ſurmount in order to render themſelves capable of anſwering this vocation. Thus the inclinations of men are ſo very different, becauſe they follow the ſame mover, that is, the impulſe of their genius. This, as with the painter, is what renders one poet pleaſing, even when he treſpaſſes againſt rules; while others are diſagreeable, notwithſtanding their ſtrict regularity.

The genius of theſe arts, according to the abbé du Bos, conſiſts in a happy arrangement of the organs of the brain; in a juſt conformation of each of theſe organs; as alſo in the quality of the blood, which diſpoſes it to ferment, during exerciſe, ſo as to furniſh plenty of ſpirits to the ſprings employed in the functions of the imagination. Here he imagines that the compoſer's blood is heated; for that painters and poets cannot invent in cool blood; nay, that it is evident they muſt be rapt into a kind of enthuſiaſm when they produce their ideas. Ariſtotle mentions a poet who never wrote ſo well as when his poetic fury hurried him into a kind of frenzy. The admirable pictures we have in Taſſo of Armida and Clorinda were drawn at the expence of a diſpoſition he had to real madneſs, into which he fell before he died. "Do you imagine, (ſays Cicero), that Pacuvius wrote in cold blood? No, it was impoſſible. He muſt have been inſpired with a kind of fury, to be able to write ſuch admirable verſes."

GENOA, a city of Italy, and formerly capital of a republic of the ſame name, ſituated in E. Long. 8. 36. N. Lat. 44. 25.—By the Latin authors it is very frequently, though corruptly called *Janua;* and its preſent territories made part of the ancient Liguria. The era of its foundation is not known. In the time of the ſecond Punic war it was a celebrated emporium; and having declared for the Romans, was plundered and burnt by Mago the Carthaginian. It was afterwards rebuilt by the Romans; and with the reſt of Italy continued under their dominion till the decline of the weſtern empire in 476. Soon after, it fell under the power of Theodoric the Oſtrogoth; who having defeated the uſurper Odoacer, became king of Italy. This happened in the year 498; and in a ſhort time, the Goths being almoſt entirely ſubdued by Beliſarius the emperor Juſtinian's general, Genoa was reannexed to the Roman empire. In 638, it was plundered and burnt by the Lombards, whoſe king Protharis erected it into a provincial dukedom.

The Lombards continued maſters of Genoa till the year 774, when they were conquered by Charles the Great, ſon to Pepin king of France. He reduced Liguria to the ancient bounds ſettled by Auguſtus, and erected it into a marquiſate: appointing his relation *Audemarus* the firſt count or margrave. Genoa at this time being diſtinguiſhed for its wealth and populouſneſs, began to give its name to the whole coaſt; and continued under the dominion of theſe counts for about 100 years, till the race of the Pepins became entirely extinct in Italy, and the empire was transferred to the German princes.—In the year 935 or 936, while the Genoeſe forces were abſent on ſome expedition, the Saracens ſurpriſed the city, which they plundered and burnt, putting to death a great number of the inhabitants, and carrying others into captivity. Having embarked their captives, together with an immenſe booty, they ſet ſail for Africa; but the Genoeſe immediately returning, purſued the invaders; and having entirely defeated them, recovered all the captives and booty, and took a great many of the enemy's ſhips. Genoa.

About the year 950, the Franks having loſt all authority in Italy, the Genoeſe began to form themſelves into a republic, and to be governed by their own magiſtrates, who were freely elected, and took the name of *Conſuls*. In order to ſupport their independence, they applied themſelves with great aſſiduity to commerce and navigation; and being apprehenſive that ſome of the German emperors, who frequently entered Italy as invaders, might renew their pretenſions to their ſtate, they conſented to acknowledge Berengarius III. duke of Friuli, who had been elected emperor by a party of Italian nobles. Berengarius, who had much ado to maintain himſelf in his new dignity, endeavoured by his conceſſions to enlarge the number of his friends and adherents; and accordingly made no difficulty to confirm the new republic in all its rights and privileges. After this the Genoeſe began to extend their commerce from Spain to Syria, and from Egypt to Conſtantinople: their veſſels, according to the cuſtom of theſe times, being fitted for fighting as well as merchandiſe. Having thus acquired great reputation, they were invited in 1017, by the Piſans, who had likewiſe formed themſelves into a republic, to join with them in an expedition againſt Sardinia, which had been conquered by the Moors. In this expedition they were ſucceſsful; the iſland was reduced; but from this time an enmity commenced between the two republics, which did not end but with the ruin of the Piſans.

The firſt war with Piſa commenced about 30 years after the Sardinian expedition, and laſted 18 years; when the two contending parties having concluded a treaty of peace, jointly ſent their forces againſt the Moors in Africa, of whom they are ſaid to have killed 100,000. The Genoeſe were very active in the time of the cruſades, and had a principal ſhare in the taking of Jeruſalem. They alſo waged conſiderable wars with the Moors in Spain, of whom they generally got the better. They alſo prevailed againſt the neighbouring ſtates; and, in 1220, had enlarged their territories beyond the ſkirts of the Apennines, ſo that the reſt of Italy looked upon them with a jealous eye; but in 1311 the factions which had for a long time reigned in the city, notwithſtanding all its wealth and power, induced

Genoa induced the inhabitants to submit themselves for 20 years to the dominion of Henry VII. emperor of Germany. That emperor, however, died in August 1312; and the vicar he had left soon after went to Pisa, upon which the dissensions in Genoa revived with greater fury than ever. In 1317, a quarrel happened between the families of Spinola and Doria; which came to such a height, that both parties fought in the streets for 24 days without intermission, raised battering engines against each other's houses, and filled the city with blood. At last the Spinolæ quitted the city, and retired to their territories in the Apennine mountains. The civil war continued till the year 1331; when, by the mediation of the king of Naples, it was concluded, that all exiles should return to the city; that the republic should be governed by the king's vicar; and all the offices of the state be equally divided between the Guelfs and the Gibellines, the two contending parties.

By this ruinous war, the coast of Genoa, formerly adorned with palaces and vineyards, was now reduced to the appearance of a barren waste. So great was the general desolation, that, according to Petrarch, the spectators who sailed along were struck with astonishment and horror. Villani, a cotemporary author, relates, that it was supposed by the learned, that greater exploits had not been performed at the siege of Troy; and that the losses each party had sustained would have been sufficient to have purchased a kingdom, the Genoese republic being in his time the richest and most powerful state in Christendom. The annalist Stella informs us, that, before the war, the most extravagant profusion and luxury prevailed among the Genoese: but that, towards the end, many noble families were reduced to indigence and poverty; so that about 100 years after, it became fashionable for the nobles to live in a plain manner, without any show or magnificence.

In 1336, both parties, suspending their mutual animosities, sent two fleets of 20 galleys each into the German ocean, to the assistance of the king of France, who was engaged in a war with Edward III. king of England. This naval expedition proved the cause of a most remarkable revolution in the Genoese government. The sailors of the fleet, thinking themselves injured by their officers, whom they accused of defrauding them of their pay, proceeded to an open mutiny; and, having expelled the admiral, and other commanders, seized the galleys. The king of France being chosen arbitrator, decided in favour of the officers, and imprisoned 16 of the chiefs of the mutineers. Upon this several of the sailors left the fleet, and returned to Genoa; where they went round the coasts, repeating their mutinous complaints, which were greatly hearkened to, upon a false report that the mutineers who had been imprisoned were broke upon the wheel. The factious spirit increased: and at last the Genoese insisted in a tumultuous manner for having an abbot of their own choosing, and 20 of the people with the consent of the captains of the republic assembled for that purpose. While the mob were impatiently expecting their decision, a mechanic, generally accounted a fool, mounted a wooden bench, and called out that one Simon Bucanigree should be chosen abbot. This being instantly echoed by the populace, he was first declared *abbot*, then *lord*, and at last *duke* of Genoa. Genoa.

This new expedient did not at all answer the purpose. The dissensions continued as violent as ever, notwithstanding the power of the new magistrates; and by these perpetual divisions the republic was at last so much weakened, that in 1390 the king of France was declared lord of Genoa. Under the French government, however, they soon became exceedingly impatient; and, in 1422, the duke of Milan obtained the sovereignty. With this situation they were equally displeased, and therefore revolted in 1436. Twenty-two years after, finding themselves pressed by a powerful fleet and army sent by Alphonso king of Naples, they again conferred the sovereignty of their state upon the king of France. In 1460, they revolted from the French; and, four years after, put themselves again under the protection of the duke of Milan: from whom they revolted in 1478. He was again declared sovereign of the republic in 1488; and, 11 years after, the city and territories of Genoa were conquered by Louis XII. of France.

The almost unparalleled fickleness of the Genoese disposition was not to be corrected by this misfortune. They revolted in 1506; but next year were again subdued by Louis. Six years after, they again revolted; and in 1516, the city was taken and plundered by the Spaniards. In 1528, Andrew Doria, a Genoese admiral in the service of the French, undertook to rescue his country from the dominion of foreign princes, and restore it to its liberty. Knowing well the fickle disposition of his countrymen, he took all occasions of exciting discontents among them against the government. He persuaded them, that the French (who had again obtained the sovereignty) had left them only a shadow of liberty, while they pretended to protect them from their enemies. To the nobility he represented the disgrace of suffering the government to be vested in the hands of foreigners less worthy of authority than themselves. Thus he soon formed a strong faction, and formed his plan; for the execution of which he took the most proper time, namely, when almost three-fourths of the French garrison had been carried off by the plague. He advanced with 500 men; and his friends having opened the gates of the city to him, he seized the principal posts, and thus became master of it without drawing his sword. The garrison retired to the forts, where they soon after capitulated, and being driven out of the city, Doria re-established the ancient form of government. See Doria.

The republic hath since continued to preserve her liberty, though greatly fallen from her ancient splendour, and now become a very inconsiderable state. In 1684, the Genoese had the misfortune to fall under the resentment of Louis XIV. at which time the city was almost destroyed by a formidable bombardment. In the year 1688, it was bombarded by Admiral Byng, and forced to capitulate; but there were at that time no views of making a permanent conquest of the city. In 1730, the island of Corsica revolted from the Genoese, and could never afterwards be reduced by them; for which reason it was sold to the French, who in the year 1770 totally reduced it.

The

Genoa. The Genoeſe territories extend along that part of the Mediterranean ſea, commonly called the *gulf of Genoa*, about 152 miles; but their breadth is very unequal, being from eight to about 20 miles. Where they are not bounded by the ſea, the following ſtates and countries, taking them from weſt to eaſt, are their boundaries, viz. Piedmont, Montferrat, Milan, Placentia, Parma, the dukedom of Tuſcany, and the republic of Lucca. This tract, though a great part of it is mountainous, and ſome of that barren enough, yet produces plenty of excellent fruit, good paſture, wood, garden ſtuff, and mulberry trees, with ſome wine and oil, but little corn. What they want of the laſt, they have either from Lombardy, Sicily, or Naples.

Genoa ſtands on the coaſt of the Mediterranean ſea, at the bottom of a little gulf, partly on the flat, and partly on the declivity, of a pleaſant hill; in conſequence of which, it appears to great advantage from the ſea. It is defended on the land ſide by a double wall, which in circumference is about ten Italian miles. Two of the ſtreets conſiſt entirely of a double ſtraight row of magnificent palaces. The others, though clean and well paved, are crooked and narrow. The palaces of the nobility are almoſt all of marble, and many of them are painted on the outſide. That there ſhould be ſuch a profuſion of marble here, is not to be wondered at, as the neighbouring hills abound with it. The city contains a vaſt number of palaces, churches, and convents, and ſeveral hoſpitals. The palace where the doge reſides, and where the great and little council, and the two colleges of the procuratori and governatori aſſemble, is a large ſtone building in the centre of the city. It contains ſome fine paintings in freſco; two ſtatues of Andrew and John Doria in white marble; and an arſenal, in which are ſaid to be arms for thirty-four thouſand men, with a ſhield, containing one hundred and twenty piſtol barrels, and thirty-three coats of mail, which, it is pretended, were worn by as many Genoeſe heroines in a croiſade. Of the churches, the fineſt are thoſe of the Annunciation, St Mary Carignan, St Dominic, and St Martha. In the cathedral is a diſh made of a ſingle emerald. All the inhabitants here, except the principal ladies, who are carried in chairs, walk on foot, on account of the narrowneſs or ſteepneſs of the ſtreets. The fortifications of the city, towards the ſea, are remarkably ſtrong. There are two fine ſtone bridges over the rivers Bonzerva and Biſagno, the firſt whereof waſhes the weſt, and the other the eaſt ſide of the city, within which there is alſo a ſurpriſing ſtone bridge joining two hills. The harbour, though large, is far from being ſafe; but no care or expence has been ſpared to render it as ſafe and commodious as poſſible. The wind to which it is moſt expoſed, is that called *Labeccio*, or the ſouth-weſt. The place where the republic's galleys lie, is called the Darſena, where are a great number of Turkiſh ſlaves. On a rock, on the weſt ſide of the harbour, is the fanal or lighthouſe, a high tower, on the top of which is a lanthorn, containing thirty-ſix lamps. The population of Genoa is eſtimated at 150,000, and the trade is chiefly in velvets, damaſks, pluſh, and other ſilks, brocades, lace, gloves, ſweetmeats, fruits, oil, Parmeſan cheeſe, anchovies, and medicinal drugs from the Levant; but the badneſs of the harbour, and the high price of commodities, greatly checks the commerce. In 1751, Genoa was declared a free port for ten years, under certain reſtrictions: in that called *Porto Franco*, any merchant may have a warehouſe, and import or export goods duty free; but ſuch as are diſpoſed of in the city, or on the continent, are taxed pretty high. The nobility are allowed to trade in the wholeſale way; to carry on velvet, ſilk, and cloth manufactures; and to have ſhares in merchant ſhips: and ſome of them, as the Palavicini, are actually the greateſt merchants in Genoa. Another very profitable article of trade carried on by them is banking, and dealing in bills of exchange. A new academy of painting, ſculpture, civil and military architecture, was inſtituted here in 1751. One may walk the ſtreets of Genoa in the night with the greateſt ſafety, which is more than can be ſaid of many cities in Italy. Exceſſive ſplendour and luxury are, in ſeveral reſpects, reſtrained by ſalutary laws. No beggars are permitted to aſk alms in Genoa, and the inns are better than thoſe at Turin. When a ſingle perſon is buried, a kind of garland of all ſorts of artificial flowers is placed on the coffin. The Genoeſe in general are eſteemed crafty, induſtrious, and inured to labour above the other Italians. Genoa.

Amidſt the political convulſions which agitated Europe, in conſequence of the unexampled French revolution, it was ſcarcely to be expected that Genoa would eſcape the ſhock. Accordingly in the year 1798, by the force and intrigues of the French republicans, its political conſtitution was totally ſubverted, and changed into what was afterwards denominated the *Ligurian Republic*, which was to be governed in a manner ſimilar to that of their own, and the country alſo was divided into departments. As the preceding campaign had terminated in favour of the combined powers, and left them in the poſſeſſion of every important place in Italy, this only excepted, the capture of it became an object of the utmoſt conſequence to the contending parties. To regain it was the higheſt ambition of the houſe of Auſtria, while the retaining of it was matter of ſolicitude to the French republic. The reaſon is obvious. The conqueſt of it reſtored to the emperor of Germany the poſſeſſion of all Italy, gave him the means of reſuming his former poſitions in the Maritime Alps, and reinforcing his former poſition on the Rhine. To the French it was a place of the utmoſt conſequence, becauſe while they were enabled to retain it in their own hands, they could eaſily favour the operations of their army in Switzerland, or their entrance into Italy by the defiles of Piedmont.

As the allies were fully determined on its conqueſt for the reaſons already aſſigned, as well as for others of an inferior nature and magnitude, it is but candid to admit that the general by whom it was defended had innumerable difficulties to ſtruggle with, and obſtacles to ſurmount. When Maſſena ſucceeded Championet, the army was reduced to the moſt melancholy ſituation. Confined during the winter ſeaſon to the bleak ſummits of the Apennines, it was reduced in numbers more than one half, and a conſtant prey to famine and diſeaſe. To add to the difficulties which everywhere preſented themſelves to Maſſena, the higher claſſes of the Genoeſe looked upon the French only as the deſtroyers of their rank, commerce, and political importance; in conſequence of which they ſecretly aided every meaſure by which they might be driven from the country. Inſtead

Genoa || Gentileſchi.

of 60,000 men which he was promiſed, Maſſena had no more than 20,000 after all his unwearied exertions, and with theſe he had to defend an extent of country from Mount Cenis to the frontiers of Tuſcany. He wiſely diſmiſſed all the former generals, independent of their merit, becauſe the ſoldiers aſſociated with them the idea of former miſery and diſgrace. In addition to the ſuperior ſtrength of the Auſtrian army, Maſſena found a formidable inſurrection raiſed againſt him in the eaſtern territory of the Genoeſe republic. The paſſage by ſea was obſtructed by the Britiſh fleet, and his expected ſuccours from Marſeilles only reached him in part. As he could not meet the army in the field by which he was blockaded, his only alternative was to remain in Genoa, every moment in dread of periſhing by famine, if not ſpeedily relieved.

In the mean time, the Auſtrian army had nothing to do during the winter but to remain in a ſtate of obſervation; the diſtreſs to which the republican general was reduced was unſpeakably great. After enduring a number of hardſhips with the moſt undaunted fortitude, and finding the city no longer tenable, a principle of humanity for his diſtreſſed army and the ſtarving inhabitants induced him to ſurrender.

In the progreſs of ſubſequent hoſtilities the French again obtained poſſeſſion of it, and it is now (1806) ſubject to the dominion of a brother of Bonaparte's, who has aſſumed the title of king of Italy.

GENSING. See PANAX, BOTANY *Index*.

GENTIANA, GENTIAN, a genus of plants belonging to the pentandria claſs; and in the natural method ranking under the 20th order, *Rotaceæ*. See BOTANY *Index*.

GENTILE, in matters of religion, a Pagan, or worſhipper of falſe gods.

The origin of this word is deduced from the Jews, who called all thoſe who were not of their name גוים *gojim*, i. e. *gentes*, which in the Greek tranſlations of the Old Teſtament is rendered τα εθνα; in which ſenſe it frequently occurs in the New Teſtament; as in Matth. vi. 32. "All theſe things the nations or Gentiles ſeek." Whence the Latin church alſo uſed *gentes* in the ſame ſenſe as our *Gentiles*, eſpecially in the New Teſtament. But the word *gentes* ſoon got another ſignification, and no longer meant all ſuch as were not Jews; but thoſe only who were neither Jews nor Chriſtians, but followed the ſuperſtitions of the Greeks and Romans, &c. In this ſenſe it continued among the Chriſtian writers, till their manner of ſpeech, together with their religion, was publicly and by authority received in the empire; when *gentiles*, from *gentes*, came into uſe: and then both words had two ſignifications, viz. in treatiſes or laws concerning religion, they ſignified Pagans, neither Jews nor Chriſtians; and in civil affairs, they were uſed for all ſuch as were not Romans.

GENTILE, in the Roman law and hiſtory, a name which ſometimes expreſſes what the Romans otherwiſe called *barbarians*, whether they were allies of Rome or not: but this word was uſed in a more particular ſenſe for all ſtrangers and foreigners not ſubject to the Roman empire.

GENTILESCHI, HORATIO, an Italian painter, was born at Piſa in 1563. After having made himſelf famous at Florence, Rome, Genoa, and other parts of Italy, he removed to Savoy; from whence he went to France, and at laſt, upon the invitation of Charles I. came over to England. He was well received by that king, who appointed him lodgings in his court, together with a conſiderable ſalary; and employed him in his palace at Greenwich, and other public places. The moſt remarkable of his performances in England, were the ceilings of Greenwich and York houſe. He did alſo a Madona, a Magdalen, and Lot with his two daughters, for King Charles; all which he performed admirably well. After the death of the king, when his collection was expoſed to ſale, nine pictures of Gentileſchi were ſold for 600l. and are now ſaid to be the ornaments of the hall in Marlborough houſe. His moſt eſteemed piece abroad was the portico of Cardinal Bentivoglio's palace at Rome. He made ſeveral attempts in face painting, but with little ſucceſs; his talent lying altogether in hiſtories, with figures as big as the life. He was much in favour with the duke of Buckingham, and many others of the nobility. After 12 years continuance in England, he died here at 84 years of age, and was buried in the queen's chapel at Somerſet-houſe. His print is among the heads of Vandyke, he having been drawn by that great maſter. He left behind him a daughter, *Artemiſia Gentileſchi*, who was but little inferior to her father in hiſtory painting, and excelled him in portraits.

Gentileſchi || Gentleman.

GENTILIS, ALBERICUS, profeſſor of civil law at Oxford; an Italian by birth. He had quitted Italy with his father, on account of religion. He wrote ſeveral works; three books, in particular, *De jure belli*, which have not been unſerviceable to Grotius. He died at London in 1608.

GENTILIS, *Scipio*, brother to the former, and as celebrated a civilian as he, forſook his native country that he might openly profeſs the Proteſtant religion. He was counſellor of the city of Nuremberg, and profeſſor of law with uncommon reputation. He was a great humaniſt; and in his lectures, as well as books, mixed the flowers of polite learning with the thorns of the law. He died in 1616.

GENTLEMAN. Under this denomination are comprehended all above the rank of yeomen*, whereby noblemen are truly called *gentlemen*.

* See *Commonalty*.

A gentleman is uſually defined to be one, who, without any title, bears a coat of arms, or whoſe anceſtors have been freemen: and by the coat that a gentleman giveth, he is known to be, or not to be, deſcended from thoſe of his name that lived many hundred years ſince.

The word is formed of the French *gentilhomme*; or rather of *gentil*, "fine, faſhionable, or becoming;" and the Saxon *man*, q. d. *honeſtus*, or *honeſto loco natus*.—The ſame ſignification has the Italian *gentilhuomo*, and the Spaniſh *hidalgo*, or *hijo dalgo*, that is, the ſon of ſomebody, or a perſon of note.—If we go farther back, we ſhall find *gentleman* originally derived from the Latin *gentilis homo*; which was uſed among the Romans for a race of noble perſons of the ſame name, born of free or ingenuous parents, and whoſe anceſtors had never been ſlaves or put to death by law. Thus Cicero in his *Topics*, "*Gentiles ſunt, qui inter ſe eodem ſunt nomine, ab ingenuis oriundi, quorum majorum nemo ſervitutem ſervivit, qui capite non ſunt diminuti*," &c.

—Some

Gentleman, Gentoos.

—Some hold that it was formed from *gentile*, i. e. pagan; and that the ancient Franks, who conquered Gaul, which was then converted to Chriſtianity, were called *gentiles* by the natives, as being yet heathens.—Others relate, that towards the declenſion of the Roman empire, as recorded by Ammianus Marcellinus, there were two companies of brave ſoldiers, the one called *gentiles*, and the other *ſcutarii*; and that it was hence we derive the names *gentleman* and *eſquire*. See ESQUIRE.—This ſentiment is confirmed by Paſquire, who ſuppoſes the appellation *gentiles* and *ecuyers* to have been tranſmitted to us from the Roman ſoldiery; it being to the *gentiles* and *ſcutarii*, who were the braveſt of the ſoldiery, that the principal benefices and portions of land were aſſigned. See BENEFICE.—The Gauls obſerving, that during the empire of the Romans, the *ſcutarii* and *gentiles* had the beſt tenements or appointments of all the ſoldiers on the frontiers of the provinces, became inſenſibly accuſtomed to apply the ſame names, *gentilhommes* and *ecuyers*, to ſuch as they found their kings gave the beſt proviſions or appointments to.

GENTLEMAN Uſher of the Black Rod. See ROD.

GENTLEMEN of the Chapel; officers whoſe duty and attendance is in the royal chapel, being in number 32. Twelve of them are prieſts; the other 20, commonly called *clerks of the chapel*, aſſiſt in the performance of divine ſervice. One of the firſt 12 is choſen for confeſſor of the houſehold; whoſe office is to read prayers every morning to the houſehold ſervants, to viſit the ſick, examine and prepare communicants, and adminiſter the ſacrament. One of 20 clerks, well verſed in muſic, is choſen firſt organiſt, who is maſter of the children, to inſtruct them in muſic, and whatever elſe is neceſſary for the ſervice of the chapel; a ſecond is likewiſe an organiſt; a third, a lutaniſt; and a fourth a violiſt. There are likewiſe three vergers, ſo called from the ſilver rods they carry in their hands; being a ſerjeant, a yeoman, and groom of the veſtry; the firſt attends the dean and ſubdean, and finds ſurplices and other neceſſaries for the chapel; the ſecond has the whole care of the chapel, keeps the pews, and ſeats of the nobility and gentry; the groom has his attendance within the chapel door, and looks after it.

GENTOOS, in modern hiſtory, according to the common acceptation of the term, denote the profeſſors of the religion of the bramins or brachmans, who inhabit the country called *Hindoſtan*, in the Eaſt Indies, from the word *ſtan*, a "region," and *hind* or *hindoo*; which Feriſhtah, as we learn from Colonel Dow's tranſlation of his hiſtory, ſuppoſes to have been a ſon of Ham the ſon of Noah. It is obſerved, however, that Hindoo is not the name by which the inhabitants originally ſtyled themſelves; but according to the idiom of the *Shanſerit* which they uſe, *jumbodeep*, from *jumboo*, a "jackall," an animal common in their country; and *deep*, a large portion of land ſurrounded by the ſea; or *bhertekhunt*, from *khunt*, i. e. "a continent," and *bherrhut*, the name of one of the firſt Indian rajahs. It is alſo to be obſerved, that they have aſſumed the name of *Hindoos* only ſince the era of the Tartar government, to diſtinguiſh themſelves from their conquerors the Muſſulmans. The term *Gentoo* or *Gent*, in the Shanſcrit dialect, denotes *animal* in general, and in its more confined ſenſe *mankind*, and is never appropriated particularly to ſuch as follow the doctrines of Brama. Theſe are divided into four great tribes, each of which has its own ſeparate appellation; but they have no common or collective term that comprehends the whole nation under the idea affixed by the Europeans to the word *Gentoo*. Mr Halhed, in the preface to his tranſlation of the Code of Gentoo Laws, conjectures that the Portugueſe, on their firſt arrival in India, hearing the word frequently in the mouths of the natives, as applied to mankind in general, might adopt it for the domeſtic appellation of the Indians themſelves, or perhaps their bigotry might force from the word *Gentoo* a fanciful alluſion to gentile or Pagan. The Hindoos, or Gentoos, vie with the Chineſe as to the antiquity of their nation. They reckon the duration of the world by four jogues, or diſtinct ages; the firſt the Suttee jogue, or age of purity, which is ſaid to have laſted about 3,200,000 years; during which the life of man was 100,000 years, and his ſtature 21 cubits: the ſecond, the Tirtab jogue, or the age in which one-third of mankind were reprobate; which conſiſted of 2,400,000 years, when men lived to the age of 10,000 years: the third, the Dwaper jogue, in which half of the human race became depraved, which endured to 600,000 years, when men's lives were reduced to 1000 years: and fourthly, the Collee jogue, in which all mankind were corrupted, or rather diminiſhed, which the word *collee* imports. This is the preſent era, which they ſuppoſe will ſubſiſt for 400,000 years, of which near 5000 are already paſt; and man's life in this period is limited to 100 years. It is ſuppoſed by many authors, that moſt of the Gentoo *ſhaſters*, or ſcriptures, were compoſed about the beginning of the Collee jogue: but an objection occurs againſt this ſuppoſition, viz. that the ſhaſters take no notice of the deluge; to which the bramins reply, that all their ſcriptures were written before the time of Noah, and the deluge never extended to Hindoſtan. Nevertheleſs, it appears from the ſhaſters themſelves, that they claim a much higher antiquity than this; inſtances of which are recited by Mr Halhed.

Gentoos.

The doctrine of tranſmigration is one of the diſtinguiſhing tenets of the Gentoos. With regard to this ſubject, it is their opinion, according to Mr Holwell, that thoſe ſouls which have attained to a certain degree of purity, either by the innocence of their manners or the ſeverity of their mortifications, are removed to regions of happineſs proportioned to their reſpective merits: but that thoſe who cannot ſo far ſurmount the prevalence of bad example, and the powerful degeneracy of the times, as to deſerve ſuch a promotion, are condemned to undergo continual puniſhment in the animation of ſucceſſive animal forms, until, at the ſtated period, another renovation of the four jogues ſhall commence, upon the diſſolution of the preſent. They imagine ſix different ſpheres above this earth; the higheſt of which called *ſuttee*, is the reſidence of Brama, and his particular favourites. This ſphere is alſo the habitation of thoſe men who never uttered a falſehood, and of thoſe women who have voluntarily burned themſelves with their huſbands; the propriety of which practice is expreſsly enjoined in the code of the Gentoo laws. This code, printed by the Eaſt India Company in 1776, is a very curious collection of Hin-

Gentoos, Genuflexion.

doo juriſprudence, which was ſelected by the moſt experienced pundits or lawyers from curious originals in the Shanſcrit language, who were employed for this purpoſe from May 1773 to February 1775; afterwards tranſlated into the Perſian idiom, and then into the Engliſh language by Mr Halhed.

The ſeveral inſtitutes contained in this collection are interwoven with the religion of the Gentoos, and revered as of the higheſt authority. The curious reader will diſcover an aſtoniſhing ſimilarity between the inſtitutes of this code and many of the ordinances of the Jewiſh law: between the character of the bramins or prieſts, and the Levites; and between the ceremony of the ſcape goat under the Moſaic diſpenſation, and a Gentoo ceremony called the *aſhummed jug*, in which a horſe anſwers the purpoſe of the goat. Many obſolete cuſtoms and uſages alluded to in many parts of the Old Teſtament, may alſo received illuſtrations from the inſtitutes of this code. It appears from the code, that the bramins, who are the prieſts and legiſlators of the country, have reſigned all the ſecular and executive power into the hands of another caſt or tribe; and no bramin has been properly capable of the magiſtracy ſince the time of the ſuttee jogue. The only privilege of importance which they have appropriated to themſelves, is an exemption from all capital puniſhment: they may be degraded, branded, impriſoned for life, or ſent into perpetual exile; but it is everywhere expreſsly ordained, that a bramin ſhall not be put to death on any account whatſoever.

We have already obſerved, that the Hindoos are divided into four great and original tribes, which according to the Gentoo theology proceeded from the four different members of Brama, the ſuppoſed immediate agent of the creation under the ſpirit of the Almighty. Theſe tribes are the Bramins, which proceeded from his mouth, and whoſe office is to pray, read, and inſtruct; the Chehteree, which proceed from his arms, whoſe office is to draw the bow, to fight, and to govern; the Bice, proceeding from the belly or thighs, who are to provide the neceſſaries of life by agriculture and traffic; and the Soonder, from the feet, which are ordained to labour, ſerve, and travel.

Few Chriſtians, ſays the tranſlator of the Gentoo code, have expreſſed themſelves with a more becoming reverence of the grand and impartial deſigns of Providence, in all his works, or with a more extenſive charity towards all their fellow creatures of every profeſſion, than the Gentoos. It is indeed an article of faith among the Bramins, that God's all merciful power would not have permitted ſuch a number of different religions, if he had not found a pleaſure in beholding their varieties.

GENUFLEXION, (of *genu*, "knee," and *flecto* "I bend,") the act of bowing or bending the knee; or rather of kneeling down.

The Jeſuit Roſweyd, in his Onomaſticon, ſhows, that genufluxion, or kneeling, has been a very ancient cuſtom in the church, and even under the Old Teſtament diſpenſation; and that this practice was obſerved throughout all the year, excepting on Sundays, and during the time from Eaſter to Whitſuntide, when kneeling was forbidden by the council of Nice.

Others have ſhown, that the cuſtom of not kneeling on Sunday had obtained from the time of the apoſtles, as appears from St Irenæus, and Tertullian; and the Ethiopic church, ſcrupulouſly attached to the ancient ceremonies, ſtill retains that of not kneeling at divine ſervice. The Ruſſians eſteem it an indecent poſture to worſhip God on the knees. Add, that the Jews uſually prayed ſtanding. Roſweyd gives the reaſons of the prohibition of genuflexion on Sundays, &c. from St Baſil, Anaſtaſius, St Juſtin, &c.

Genus.

Baronius is of opinion, that genuflexion was not eſtabliſhed in the year of Chriſt 58, from that paſſage in Acts xx. 36. where St Paul is expreſsly mentioned to kneel down at prayer; but Saurin ſhows, that nothing can be thence concluded. The ſame author remarks, alſo, that the primitive Chriſtians carried the practice of genuflexion ſo far, that ſome of them had worn cavities in the floor where they prayed: and St Jerome relates of St James, that he had contracted a hardneſs on his knees equal to that of camels.

GENUS, among metaphyſicians and logicians, denotes a number of beings which agree in certain general properties common to them all: ſo that a genus is nothing elſe but an abſtract idea, expreſſed by ſome general name or term. See LOGIC and METAPHYSICS.

GENUS, is alſo uſed for a character or manner applicable to every thing of a certain nature or condition: in which ſenſe it ſerves to make capital diviſions in divers ſciences, as medicine, natural hiſtory, &c.

GENUS, in *Rhetoric*. Authors diſtinguiſh the art of rhetoric, as alſo orations or diſcourſes produced thereby, into three genera or kinds, demonſtrative, deliberative, and judiciary. To the demonſtrative kind belong panegyrics, genethliacons, epithalamiums, funeral harangues, &c. To the deliberative belong perſuaſions, diſſuaſions, commendations, &c. To the judiciary kind belong defences and accuſations.

GENUS, in *Medicine*. See MEDICINE, under the *Noſology*.

GENUS, in *Natural Hiſtory*, a ſubdiviſion of any claſs or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, which agree in certain common characters. See *NATURAL Hiſtory*.

GENUS, in *Muſic*, by the ancients called *genus melodicum*, is a certain manner of dividing and ſubdividing the principles of melody; that is, the conſonant and diſſonant intervals, into their concinnous parts.

The moderns conſidering the octave as the moſt perfect of intervals, and that whereon all the concords depend, in the preſent theory of muſic, the diviſion of that interval is conſidered as containing the true diviſion of the whole ſcale.

But the ancients went to work ſomewhat differently: the diateſſaron, or fourth, was the leaſt interval which they admitted as concord; and therefore they ſought firſt how that might be moſt conveniently divided; from whence they conſtituted the diapente and diapaſon.

The diateſſaron being thus, as it were, the root and foundation of the ſcale, what they called the *genera*, or kinds, aroſe from its various diviſions; and hence they defined the *genus modulandi* to be the manner of dividing the tetrachord and diſpoſing its four ſounds as to ſucceſſion.

The genera of muſic were three, the enharmonic, chromatic, and diatonic. The two firſt were variouſly ſubdivided;

Genus || Geoffroy.

ſubdivided; and even the laſt, though that is commonly reckoned to be without any ſpecies, yet different authors have propoſed different diviſions under that name, without giving any particular names to the ſpecies as was done to the other two.

For the characters, &c. of theſe ſeveral genera, ſee ENHARMONIC, CHROMATIC, and DIATONIC.

GEOCENTRIC, in *Aſtronomy*, is applied to a planet, or its orbit, to denote it concentric with the earth, or as having the earth for its centre, or the ſame centre with the earth.

GEOFFRÆA, a genus of plants belonging to the diadelphia claſs, and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY and MATERIA MEDICA *Index*.

GEOFFREY of MONMOUTH, biſhop of St Aſaph, called by our ancient biographers *Gallofridus Monumenteníis*. Leland conjectures that he was educated in a Benedictine convent at Monmouth, where he was born; and that he became a monk of that order. Bale, and after him Pits, call him archdeacon of Monmouth; and it is generally aſſerted that he was made biſhop of St Aſaph in the year 1151 or 1152, in the reign of King Stephen. His hiſtory was probably finiſhed after the year 1138. It contains a fabulous account of Britiſh kings, from the Trojan Brutus to the reign of Cadwallader in the year 690. But Geoffrey, whatever cenſure he may deſerve for his credulity, was not the inventor of the ſtories he relates. It is a tranſlation from a manuſcript written in the Britiſh language, and brought to England from Armorica by his friend Gualter, archdeacon of Oxford. But the achievements of King Arthur, Merlin's prophecies, many ſpeeches and letters, were chiefly his own addition. In excuſe for this hiſtorian, Mr Wharton judiciouſly obſerves, that fabulous hiſtories were then the faſhion, and popular traditions a recommendation to his book.

GEOFFROY, STEPHEN-FRANCIS, a phyſician eminent for his chemical and botanical knowledge, was born at Paris in the year 1672, where his father kept an apothecary's ſhop, and had been ſeveral times in the magiſtracy. He received a liberal education; and, while proſecuting the ſtudy of medicine, he had conferences at his father's houſe with Caſſini, du Verney, Homberg, and other men of diſtinguiſhed eminence. At Montpellier he attended the lectures of the moſt able profeſſors of phyſic, and afterwards viſited the ſouth of France, carefully viewing every object deſerving of his attention. He accompanied count de Tallard to England in 1698, where he became acquainted with the chief men of ſcience, and was made a member of the Royal Society. He next went into Holland, and in 1700 he attended the abbe de Louvois in a tour to Italy. He was, on his return, made bachelor of medicine in 1702, and, in two years after, he was created M. D. One of his theſes was on the queſtion, "*An hominis primordia vermis?*" which was tranſlated into French for the ſake of ſome ladies of exalted rank, by whom it was deemed intereſting. Geoffroy, Geographical.

Geoffroy did not haſtily commence the practice of medicine, continuing the proſecution of his ſtudies in retirement for ſome years. He never appeared anxious to puſh himſelf forward, although his knowledge made him be often conſulted by ſeveral gentlemen of the faculty. He was ſo concerned for the recovery of his patients, that it gave him an air of melancholy, which at firſt alarmed them, till they became acquainted with the cauſe. He was, in 1709, made profeſſor of phyſic by the king to the Royal College, vacant by the death of the celebrated Tournefort. He began with lectures on materia medica; and in 1712, M. Fagon reſigned to him the chemical chair: on both which topics Geoffroy lectured with unwearied aſſiduity. He was twice choſen to the office of dean by the faculty of Paris, and he filled a place in the Royal Academy of Sciences, from the year 1699. His health at laſt yielded to his toils, and he died in January, 1731. He is known to the chemical world by his table of affinities, far ſuperior to any which had appeared before his time. His greateſt work was his Hiſtory of the Materia Medica, which, in an unfiniſhed ſtate, was publiſhed after his death in the year 1741, in 3 vols. 8vo.

GEOGRAPHICAL MILE, the ſame with the ſea mile; being one minute, or the 60th part of a degree of a great circle on the earth's ſurface.

GEOGRAPHY.

INTRODUCTION.

1 Definition.

GEOGRAPHY is that part of knowledge which deſcribes the ſurface of the earth; its diviſions, extent, and boundaries; the relative poſition of the ſeveral countries and places on the globe, and the manners, cuſtoms, and political relations of their inhabitants. The word is Greek γεωγραφια, from γη or γεα, *terra*, "the earth," and γραφω, *ſcribo*, "I write." As every thing that immediately contributes to the aſcertaining of the ſituation and limits of countries and places on the ſurface of the earth, is within the province of geography, this ſcience includes the deſcription and uſe of globes, maps, and charts, with the methods of conſtructing them.

2 Diviſion of geography.

This ſcience has been divided into GEOGRAPHY properly ſo called, or a deſcription of the *lands* of the globe, and HYDROGRAPHY, or a deſcription of the waters; but this diviſion is of little conſequence, and is now ſeldom employed. Geography has alſo been divided into *general* and *particular*, terms which are variouſly underſtood by different writers on the ſubject. By Varenius, one of the oldeſt and beſt modern writers on general geography, general or univerſal geography is uſed to denote that part of the ſubject which conſiders the earth in general, and explains its affections as a terreſtrial globe, without attending to its arbitrary diviſion into different regions; and by particular or ſpecial geography, this writer underſtands the deſcription of the particular regions of the earth: and he divides this latter into two parts; *chorography*, deſcribing ſome conſiderable

Introduction. siderable parts of the earth, as of the quarters, and *topography*, describing a particular province or district.

Geography may be conveniently divided into *descriptive* geography, or that part of the science which describes the form, limits, extent, and variety of surface of different countries, with the manners and customs of their inhabitants; and *physical* geography, or that part which teaches how to determine the situations of different places in the globe, and to lay down and delineate their positions for the information of others. Descriptive geography is the more popular and entertaining part of the subject. It is usually divided into ancient or classical geography, geography of the middle ages, and modern geography. The first branch of the subject considers the state of the earth so far as it was known or discovered at different periods, previous to the sixth century of the Christian era. The geography of the middle ages extends from the sixth to the fifteenth century, and modern geography from the fifteenth century to the present time. One of the most useful subdivisions of descriptive geography is that employed by Mr Pinkerton, who considers the geography of the several countries which he describes under four different heads. 1. *Historical* or *progressive geography*; in which he treats of the names, extent, original population, progressive geographical improvements, historical epochs and antiquities of the countries. 2. *Political geography*; under which he describes the religion and ecclesiastic institutions, government, laws, population, colonies, military force, revenue, and political relations. 3. *Civil geography*, comprehending manners and customs, language, literature, and the arts, education, cities and towns, principal edifices, roads, manufactures and commerce. And, 4. *Natural geography*, comprehending an account of the climate and seasons, face of the country, its soil, and state of agriculture, its rivers, lakes, mountains, and forests, and an enumeration of the natural productions and natural curiosities, which are usually found within each district *. Descriptive geography is sometimes styled *political* geography, while physical or general geography is called *natural* geography.

* Vid. *Pinkerton's Geography*, vol. i. p 3.

Among the other departments of this study we may mention sacred geography, or that which illustrates the sacred writings; and ecclesiastic geography, which describes the division of a country according to its church government, as into archbishoprics, bishoprics, &c.

Many writers of treatises or systems of geography give a detailed account of the historical events and commercial concerns of the several countries which they describe; but we consider this as unnecessary in a pure geographical work, as these departments belong rather to HISTORY and *POLITICAL Economy*.

Some systematic writers on geography considering the term in a very comprehensive view, as including a description of the internal structure of the earth, as well as of its surface, have thought it necessary to enter into discussions respecting the original formation of the earth, and the minerals of which it is composed. How far they are right in this we shall not pretend to determine. In this work, these subjects will be treated of under the articles GEOLOGY and MINERALOGY.

Another subject relative to the affections of the earth, respects the physical and chemical changes that take place in its atmosphere. These properly belong to the science of METEOROLOGY, and will be found under that article. Introduction.

We propose in this article to offer only an introductory outline of descriptive geography, as the several quarters of the globe, and their subdivisions into empires, kingdoms, and states, are described as particularly as is compatible with the limits of this work, under the several articles to which they belong in the general alphabet. 3 Object of this treatise.

Our attention will be chiefly directed to physical geography, especially that part of it which describes the construction and use of globes, maps, and charts.

4 Of physical geography.

Physical geography is properly a branch of mixed mathematics, and its principles depend on geometry, and its kindred sciences, trigonometry and perspective. It is intimately connected with astronomy; and as these two sciences mutually illustrate each other, they are commonly taught at the same time. The physical changes that take place on the earth, as far as it is considered in its general character of an individual of the solar system, have been already explained under ASTRONOMY; and we shall have little here to add respecting them, except as they are modified by the situation of the observer on different parts of the earth's surface.

The principles and practice of physical geography, though strictly dependent on pure mathematics, may be, for the most part, explained in a popular way, so as to be understood by the generality of readers. This popular view of the subject we shall attempt in the present article, throwing every thing that is purely mathematical into the form of notes. It must be evident, however, that a reader who is conversant with mathematics will study physical geography to more advantage; and for this purpose, it will be sufficient to possess a moderate acquaintance with arithmetic, the elements of geometry, plane trigonometry, spherics, and perspective.

5 Importance of geography.

It is scarcely necessary to enlarge on the importance or utility of geography. It is one of those sciences, the knowledge of which is almost constantly required. Without an acquaintance with the geography of the countries that are the scenes of the actions which he relates, the historian must either be extremely concise, or his narration must be obscure and unintelligible. Geography affords the best illustration of history, and is equally necessary to the historian and his reader. To the traveller, under which denomination we may class the soldier, the sailor, the merchant, as well as those who travel for pleasure or curiosity, a previous knowledge of the countries, through which he is to pass, is always useful, and often indispensable. To the politician a comprehensive knowledge of geography is of the highest importance. If he is ignorant of the extent, form, boundaries, appearances, climates, &c. of the country with which he is at war, he will plan his hostile expeditions without effect, and will send his invading armies only to perish among the defiles of the enemy, or to meet a more inglorious and deplorable fate from the diseases of the climate.

Even, if we consider geography as a study of mere amusement and curiosity, it forms one of the most rational and interesting studies in which we can engage. Nothing can be more gratifying to the observer of mankind than to survey the manners and customs of various

Hiſtory. rious nations, and to compare the relative ſtate of civilization and improvement in countries widely remote from each other. The ſtudent of geography can ſit in his cloſet, and accompany the adventurous traveller in his toilſome journey, through

> "————— antres vaſt, and deſerts wild,
> Rough quarries, rocks, and hills, whoſe heads touch heav'n !"

trace his progreſs over the boundleſs ocean, and draw from his narration a delightful fund of inſtruction and amuſement, free (except in imagination) from thoſe perils and hardſhips, which the writer had undergone. Hiſtory.

At the end of this article, we ſhall offer a few remarks on the beſt method of teaching and learning geography. We muſt now take a brief view of the origin and progreſs of the ſcience.

PART I. HISTORY AND PRESENT STATE OF GEOGRAPHY.

6 Hiſtory of geography.

AN hiſtorical account of geography would be extremely intereſting, as it would include, not only the progreſſive improvements of the ſcience, conſidered as a branch of mixed mathematics, but an account of the ſucceſſive diſcoveries of different parts of the earth that have been made by the more civilized communities. Such an account in detail, however, cannot be expected here; and we ſhall confine ourſelves principally to a curſory view of the geographical diſcoveries of ancient and modern nations, reſerving the progreſſive improvements of phyſical geography for thoſe parts of the article to which they properly belong; as they would neither be ſo intereſting nor ſo intelligible to a general reader, before he has been made acquainted with the principles of the ſcience.

7 Origin.

As ſoon as mankind had formed themſelves into ſocieties, and begun to eſtabliſh connexions with their neighbours, they would find it neceſſary to inform themſelves of the poſition of the countries which bordered on their own; and very ſoon their curioſity would lead them to deſire to form an acquaintance with the extent of the country in which they lived, and with many particulars reſpecting thoſe which were remote from them. Thus, we ſee that ſcarcely had the ſciences ariſen among the Greeks, before their philoſophers began to occupy themſelves in geographical purſuits. We are told that Anaximander exhibited to his countrymen a plan of Greece and the neighbouring countries, and in this he was imitated by his countryman Hecateus of Miletus. Of the nature of theſe ancient plans or maps, and their progreſſive improvements, we ſhall ſpeak more at large hereafter.

8 Diſcoveries of the Phœnicians.

Commerce, and the taſte for adventures, which uſually accompanies it, were doubtleſs among the firſt cauſes of geographical reſearches; but the Phœnicians are the earlieſt commercial people of whoſe diſcoveries we have any correct accounts. This people ſeem firſt to have inveſtigated the coaſts on the Mediterranean; and their navigators, extending their voyages beyond this ſea, through the narrow channel which is now called the Straits of Gibraltar, entered the Atlantic ocean, and planted colonies in Iberia, a part of Spain, in the country of Tharſhiſh, which is probably the modern Andaluſia, and upon the weſtern ſhores of Africa.

The learned Bochart, led by the analogy between the Phœnician tongue, and the oriental languages, has followed the tracks of the Phœnicians, both along the ſhores of the Mediterranean, and thoſe of the Atlantic. Theſe analogies are not always ſure guides; but we can ſcarcely doubt that the city of Cadiz was a Phœnician colony, and it is not likely that this was the only one formed by that enterpriſing people.

In the time of Solomon, Phœnician ſhips, employed by him, ſet ſail from a port in the Red ſea, called Azion-Gaber, and paſſing from that ſea through the ſtraits of Babelmandel, carried on their commerce in the Indian ocean. The country of Ophir, to which they ſailed, muſt have been at a conſiderable diſtance from the Rea ſea, as we are told that a voyage thither required three years. "The king (ſays the author of the firſt book of Kings) had a navy of Tharſhiſh, with the navy of Hiram. Once in three years came the navy of Tharſhiſh, bringing gold and ſilver, ivory, and apes and peacocks." Some have placed Ophir upon the coaſt of Africa, where the modern Sofala is ſituated: Others ſuppoſe it was a port in the iſland of Ceylon, or in the iſland of Sumatra, in which latter iſland there is ſtill a place called Ophir. The gold duſt and ivory brought from thence, ſeem to ſhew that it was an African port. (See OPHIR). M. Montucla ſuppoſes that the Phœnicians muſt even at this period have ſailed round the continent of Africa, and that Ophir was ſome place on the Gold Coaſt (A). 9 Situation of Ophir.

* *Montucla Hiſt. de Mathem.* tom. iv. p. 590.

The Carthaginians, a Phœnician colony, imitated their predeceſſors. We know that they ſailed into the Atlantic ocean, as far as the coaſt of Cornwall in England, whence they procured large quantities of tin. The ſame people made ſeveral attempts towards a complete ſurvey of the weſtern coaſt of Africa. Of theſe we have an account only of one expedition, that of Hanno, of which we have already given an account under the article AFRICA. 10 Carthaginians.

The Carthaginian navigators, if we may believe the recital of Diodorus Siculus, (lib. xv.) diſcovered a country ſituated in the Atlantic ocean, which furniſhed all the neceſſaries and conveniences of life. Some pretend that this country was America, but it is much more probable that it was ſome one of the Cape de Verd iſlands.

(A) The moſt celebrated writers who have ſupported the opinion, that Ophir was a port in Africa, are Monteſquieu, Bruce, and d'Anville. Dr Prideaux and M. Goſſelin again contend, that Ophir was a port in Arabia Felix, and the ſame with *Sabéa* or Sheba; and their opinions have lately been ably ſupported by Dr Vincent. See *Vincent's Periplus of the Erythrean Sea*, Part II.

islands. The Carthaginian senate, fearful that the relation of the sailors who had discovered such a country, might be the means of producing frequent emigrations, are said to have used every endeavour to stifle the memory of this expedition.

11 Circumnavigation of Africa.

History speaks of several voyages undertaken by order of the kings of Egypt and of Persia, for the purpose of ascertaining the extent of Africa; and Herodotus relates that Pharaoh Necho, king of Egypt, employed some Phœnician navigators to sail along the coast of Africa, for the purpose of taking a more exact survey of it. See AFRICA.

M. Gosselin, who has considered the geography of the ancients in a very learned dissertation, maintains, that the different passages of ancient writers, who have always declared that the Phœnicians and the Greeks circumnavigated Africa, are not sufficient to prove the certainty of such a voyage. The passage in Herodotus has been discussed by him at considerable length, and he seems to have proved his relation to be nothing more than a romance, founded on the historical knowledge of the Egyptians. M. Gosselin, however, admits, that many ancient voyages took place from those countries in which geography had arrived at some perfection; and there are numerous arguments, proving that all the shores of the old continent had been sailed round. See *Bailly's History of Astronomy*, p. 307. edit. 1775.

12 Voyage of Sataspes.

Xerxes king of Persia, according to Herodotus, gave a similar commission about the year before Christ 480, to one of his satraps named Sataspes, who had been condemned to die. Sataspes entered the Atlantic ocean through the straits of Gibraltar, and bending his course towards the south, he coasted the continent of Africa, till he doubled a cape which was called Syloco, and which Riccioli considers as the same with the Cape of Good Hope. He is said to have continued his course to the south for some time, and then to have returned home, assigning as a reason for not proceeding farther, that he had encountered a sea so full of herbage, that his passage had been completely obstructed. This reason appeared so ridiculous to Xerxes, that he ordered Sataspes to be crucified; but in this sentence he appears to have been rather too precipitate, as it is certain that in some latitudes there grows such a quantity of sea weed, that a vessel can scarcely make way through it; as in that part of the sea which lies between the Cape de Verd islands, the Canaries, and the coast of Africa, and is called by the Portuguese the sea of Saragossa. This shews that the relation of Sataspes may have been correct, as he might think it dangerous to attempt proceeding where he found himself so much entangled.

13 Expedition of Scylax.

Herodotus has commemorated another marine expedition, undertaken by Scylax, by order of Darius the son of Hystaspes, and which probably took place about the year 422 B. C. Scylax embarked upon the river Indus, the course of which he followed to its mouth, from whence he sailed in the course of 30 months, either into the Arabian gulf, or the Red sea. This Scylax must not be confounded with a navigator of the same name, who, at a later period, made a voyage of investigation round the Red sea.

14 Geography improved by Alexander.

The conquests of Alexander the Great, if they added little to the happiness of mankind, had at least the advantage of throwing considerable light on the state of geography at that time, as they afforded to the Greeks a more perfect knowledge of the river Indus, and of many parts of that vast country which derives its name from that river. Alexander does not seem to have penetrated to the Ganges, though his expedition led the way to the knowledge of that river; for soon after he went as far as Palibothra, a town situated on the river Indus, at its confluence with another river coming from the west. The followers of Alexander went down the Indus, as far as its opening into the Indian ocean, where they witnessed for the first time the phenomenon of the flux and reflux of the sea,—a phenomenon which excited in them great astonishment and terror. It was after this that Alexander detached, about the year 327 before Christ, two of his captains, Nearchus and Onesicritus, to investigate the coast of the Indian sea. Nearchus was ordered to return by the Red sea, and this he effected. Some fragments of his voyage have come down to us, and upon these has been formed an excellent work by Dr Vincent, entitled the "Periplus of the Erythrean Sea." This learned and valuable work is just completed by the publication of the Second Part, and affords much additional illustration of the geographical information and commercial enterprises of the ancients.

Onesicritus sailed to the east, and if we may believe the account that is left of his voyage, he gave us the first exact information respecting the island of Ceylon. The measure given by Onesicritus, of the extent of the island which he investigated, viz. 7000 stadia, does not correspond to Ceylon, whether we consider the length or circumference of the island, (see CEYLON); and if we take it as the measure of the length, it more nearly corresponds to that of Sumatra. The relations of Nearchus and Onesicritus were extant in the time of Strabo, by whom the latter is said to exceed, in point of exaggeration, all the other historians of Alexander's expedition. At the same time, it must be acknowledged that there are many things related by Onesicritus, as quoted by Strabo, which sufficiently agree with what we know of India, and the productions of that country: for he speaks of the sugar cane, the cotton plant, the bamboo, &c.

15 By Ptolemy Philadelphus.

The kings of Egypt who succeeded Alexander, took considerable interest in the progress of geography. The second of these kings, Ptolemy Philadelphus, about the year 280 before Christ, sent into India two ambassadors, Megasthenes and Daimachus, accompanied by the mathematician Dionysius, Megasthenes was sent to the king of Palibothra on the banks of the Ganges, and Daimachus to another Indian potentate. No account remains of the proceedings of Dionysius and Daimachus, but Megasthenes left an account of his journey, which is frequently quoted by Strabo, by whom it is considered as a mixture of real adventures and improbable exaggerations. These quotations of Strabo are certainly all that remain of the relation of Megasthenes; for the work published under the name of Megasthenes is a literary imposture, similar to the works of Berosus, Manetho and Ctesius.

16

In the reign of Ptolemy Lathyrus, about 115 years before Christ, other expeditions were undertaken, for the purpose of sailing round the continent of Africa.

Eudoxus and Cyzicus having incurred the displeasure of Ptolemy, were sent on this voyage of discovery.

They

History. They paſſed through the ſtraits of Gibraltar, and circumnavigating Africa, returned by the Red ſea. Laſtly, in the reign of Ptolemy, ſurnamed Alexander, about 90 years before Chriſt, Agatarchides, who had been the king's governor, was ſent to take a complete ſurvey of the Red ſea, and wrote an account of his voyage, of which, however, there remain only a few extracts that are preſerved by Photius, in his Bibliotheca, a work of the ninth century.

17 Voyage of Pythias. The extenſion of commerce ſeems always to have been one of the principal objects of theſe voyages of diſcovery. It is not ſurpriſing, therefore, that the inhabitants of Marſeilles, which was early celebrated as a commercial city, appear among the ancient navigators who laboured to extend geographical knowledge. Two voyagers, Pythias and Euthymenes, undertook an expedition about 320 years before the Chriſtian æra. Euthymenes entered the Atlantic through the ſtraits of Gibraltar, and turned towards the ſouth, for the purpoſe of taking a ſurvey of the coaſt of Africa. This is all that we know of his route; but Pythias ſteered northward, and after reconnoitring the coaſts of Spain and Gaul, ſailed round the iſland of Albion, and ſtretching ſtill farther to the north, diſcovered an iſland which is believed to be the modern Iceland, or the Thule of the ancients, *terrarum ultima Thule*. Perhaps, however, this was only one of the Ferro iſlands. Strabo, who appears to have been prejudiced againſt Pythias, treats his relation as fabulous, founding his opinion principally on the number of incredible circumſtances that occur in his narration. Taking theſe circumſtances, however, not according to their literal meaning, but in a figurative ſenſe, they repreſent pretty well the ſtate of the ſea and ſky in theſe countries which are ſo little favoured by nature. Pythias certainly ſeems to have been one of the firſt Greek navigators who entered the Baltic.

18 Ancient Geographers. We have thus traced the progreſs of geographical diſcoveries to very nearly the period which we aſſigned as the limit of ancient geography; and ſhall now notice very briefly ſome of the principal ſcientific geographers of antiquity, whoſe names or writings have deſcended to poſterity, and ſhall afterwards give a ſummary ſketch of the knowledge which the ancients ſeem to have poſſeſſed of the habitable globe.

As geography is a branch of knowledge intimately connected with geometry and aſtronomy, it became an object of conſideration with many of the ancient geometers and aſtronomers. We have already mentioned the names of Anaximander of Miletus, and his countryman Hecateus. Strabo alſo notices Democritus, Eudoxus of Cnidos, and Parmenides, to the laſt of whom he attributes the diviſion of the earth into zones. Theſe were followed by Eratoſthenes, who lived about 240 years before the Chriſtian æra, and Hipparchus, who flouriſhed about 80 years afterwards; Polybius, Geminus, and Poſſidonius. Eratoſthenes wrote three books on geography, of which Strabo criticiſes ſome paſſages, though he frequently defends him againſt Hipparchus, who often affects an oppoſite opinion. Polybius wrote on geography as well as hiſtory, and, as well as Geminus and Poſſidonius, is frequently quoted by Strabo. Polybius and Geminus argue with conſiderable acuteneſs for the poſſiblity of the torrid zone being inhabited, a circumſtance which was generally diſbelieved by the ancients; and they even adduce arguments which are very plauſible, to prove that the climate of the countries under the equator is more temperate than that of thoſe which are ſituated near the tropics. History.

We muſt not here omit a geographer and mathematician who lived about the time of Alexander the Great. This was Dicearchus of Meſſina, the diſciple of Theophraſtus, who wrote a deſcription of Greece in iambic verſes, of which ſome fragments yet remain. What renders this work moſt remarkable is, that it contains the height of ſeveral mountains meaſured geometrically by Dicearchus. Thus, for inſtance, the height of Mount Cylene is ſtated at 15 ſtadia, and that of Satabyce at about 14. Taking the ſtadium at 94½ toiſes, we have for the latter of theſe heights, at moſt 1400 toiſes, whereas many of the ancients aſſigned 300, 400, or even 500 ſtadia, as the height of ſome of their mountains.

With Dicearchus we may mention another geometer noticed by Plutarch in his life of Paulus Emilius; viz. Xenagoras, a diſciple of Ariſtotle, who alſo employed himſelf in meaſuring mountains, and has aſſigned only 15 ſtadia, which is equal to about 1417 toiſes, as the height of Mount Olympus. In ſome of the later periods previous to the Chriſtian æra, we find the names of ſeveral geographers, as Artemidorus of Epheſus, who wrote a geographical work in eleven books, of which nothing remains; Scymnus of Chio, author of a deſcription of the earth in iambic verſes, which remains in a very mutilated ſtate; Iſidorus of Charax, who left a deſcription of the Parthian empire, and Scylax of Caryades, author of a voyage round the Mediterranean ſea, which is ſtill extant.

19 Strabo. The works of all theſe geographers, however, are trifling when compared with the geography of Strabo, a work in 16 books, which has come down to us entire. This is one of the moſt valuable works of antiquity, both from the ſpirit of diſcuſſion which runs through it, and the number of curious obſervations which the author has collected of different geographers and navigators who preceded him; and of whoſe works nothing remains except theſe extracts. Strabo lived in the reigns of Auguſtus and Tiberius, and was nearly cotemporary with Pomponius Mela. This latter geographer wrote a work *de ſitu orbis*, which is little more than a bare ſummary, though it is valuable, as it gives us a ſketch of what was known in his time reſpecting the ſtate of the habitable globe. Pomponius Mela was followed by Julius Solenus, who has alſo treated of geography in his Polyhiſtor, a compilation which is ſufficiently valuable from the number of curious obſervations which are there collected.

20 Pomponius Mela.

21 Ptolemy. Of all the ancient geographers, poſterity is moſt indebted to Ptolemy, who produced a work much more ſcientific than had ever before been written on this ſcience; a geography in eight books, which muſt ever be conſidered as one of the principal monuments of the labours of its author. In this work there appear, for the firſt time, an application of geometrical principles to the conſtruction of maps; the different projections of the ſphere, and a diſtribution of the ſeveral places on the earth, according to their latitudes and longitudes. This work muſt have been the reſult of a great many relations both hiſtorical and geographical, that had been collected by Ptolemy. It has paſſed through numerous editions.

History.

Some time after Ptolemy, lived Dionyſius the Afri-
22 Dionyſius the Periegetic. can, commonly called the *Periegetic*, from the title of a work that he compoſed in verſe, containing a deſcription of the world, which may be conſidered as one of the moſt correct ſyſtems of ancient geography, and was by Pliny propoſed to himſelf as a pattern. This work was afterwards tranſlated into Latin verſes by Priſcian, and by Avienus, the latter of whom alſo wrote a deſcription of the maritime coaſts in iambic verſes, of which there remain about 700. Among the lateſt geographers of this period are reckoned Marcianus and Agathemares, of whom little is known, except that the latter was author of two books on geography.

23 Hudſon's collection. The ſcattered works of moſt of theſe authors being difficult to procure, were collected by Hudſon into one work, and publiſhed by him in four volumes octavo, in the years 1698, 1702, and 1712, under the title of *Geographiæ veteris ſcriptores Græciæ minores*, together with a Latin tranſlation and notes and diſſertations on each by Dodwell. In this work we find the remains of Hanno, Scylax, Nearchus, Agatarchides, Arrian, Marcianus, Dicearchus, Iſidore of Charax, Scymnus, Agathemares, Dionyſius the Periegetic, Artemidorus, Dionyſius of Biſance, Avienus, Priſcian, and ſome fragments of Strabo, of Plutarch, of Ptolemy, of Abulfeda, and of Ulug Beg. This is a moſt valuable collection, and as it had become extremely ſcarce, was a few years ago reprinted at Leipſic.

24 The above is a haſty ſketch of the names and characters of moſt of the geographical writers within the period which we have aſſigned to the ancient hiſtory of the ſcience. We ſhall have occaſion to make ſome further obſervations on the more eminent of theſe geographers in a future part of this article.

25 Geographical knowledge of the ancients. With reſpect to the knowledge of the globe that was poſſeſſed by the ancients, there have been various opinions; ſome have conſidered them as very extenſively acquainted with almoſt every part of it, not excepting ſome portion of America; while others have confined their geographical knowledge within very narrow limits. The following obſervations are chiefly drawn from M. Montucla, an eminent judge in every thing that relates to the hiſtory of the mathematical ſciences.

26 Europe. As to the knowledge which the ancients poſſeſſed of the habitable globe, it is certain that they were well acquainted with Europe, or at leaſt all that part of it which had been made ſubject to the Roman empire, as far as the banks of the Rhine and the Danube. They were tolerably well acquainted with Germany and Sarmatia. They had ſome knowledge of the Baltic ſea, as a fleet had been ſent by Auguſtus, which ſailed as far as the peninſula then called the Cimbrian Cherſoneſus, the modern Jutland. The Baltic was at that time celebrated for the production of ambergriſe. They had acquired a knowledge of the iſland of Britain, from the expeditions of Julius Cæſar, and Claudius; but the northern parts of this iſland, and the whole of Ireland, were to them nations of rude, uncivilized ſavages. The boundary of their knowledge of Europe to the north, was the Thule of Pytheas, or Iceland; at leaſt if it is certain, as is the general opinion, that this iſland is the *ultima Thule*.

27 Aſia. With reſpect to Aſia, they ſeem to have ſurveyed the country as far towards the eaſt as the river Ganges; and the immenſe extent of country comprehended between the Indus and the Ganges, was called by them *India on this ſide the Ganges*. Further on towards the north of China, in the neighbourhood of the mountains where theſe rivers derive their ſource, they placed ſeveral nations of people, of whom they related the moſt ridiculous fables. Beyond theſe, ſtill more towards the eaſt, they placed the Seres, and upon the coaſt of the gulf, which is now the bay of Cochin China, called by Ptolemy the Great Bay, were ſituated the Sinæ, ſo called by Ptolemy, though they are not mentioned by Strabo, Pomponius Mela, or Solinus. The Seres were probably the inhabitants of the northern parts of China, and the Sinæ, thoſe of the ſouthern parts of China, who very early occupied Cochin China, Tonquin, &c. countries which in the ſequel they have entirely ſubjugated. They maintained a commerce by land with the Seres, and their route is pointed out in one of Ptolemy's maps. Beyond the Seres, according to Strabo and Pomponius Mela, lay between the Oriental ſea, though Ptolemy, for want of certain intelligence reſpecting that part of Aſia, conſiders the point as undecided, and places there ſeveral unknown countries. The ancients carried this extremity of Aſia much farther to the eaſt than it is found to extend by modern geographers; for, according to them, the Seres and the Sinæ were ſituated about the longitude of 180°, while the meridian of Pekin, or about the middle of the Chineſe empire, reaches no farther than to 134°, reckoning the longitude from the moſt diſtant of the Canary iſlands, as was done by Ptolemy. To the north of the Indus the ancient geographers placed the Scythians, and Hyperboreans (the Tartars and Samoides of more modern date) and ſome other nations to an indefinite extent, who were ſuppoſed to form on that ſide an inſurmountable barrier, having behind them an ocean of ice, which was believed to communicate with the Caſpian ſea, though this was at leaſt at the diſtance of 450 leagues.

The boundary of Aſia, aſſigned by the ancients to the ſouth, was the Indian ocean, and they were acquainted with its communication with the Red ſea, by means of a ſtrait, the figure of which is very ill expreſſed in their maps. This is alſo the caſe with the Perſian gulf, with which they were acquainted, but which in the ancient maps has nearly the form of a rhombus, one ſide of which, towards the mouths of the Indus, was pretty well known to them, but the ſide next the mouths of the Ganges is very inaccurately delineated, being continued nearly in a ſtraight line. It is even probable that the iſland which Ptolemy calls Taprobana, was only the peninſula of India very much diſfigured in the delineation.

28 Situation of the iſland of Taprobana. The ſituation of this iſland of Taprobana, ſo celebrated among the ancients, is a problem in geography that is yet unſolved. It is commonly ſuppoſed to be the modern iſland of Ceylon; but the dimenſions of it as laid down by ancient geographers, render this ſuppoſition doubtful, and there are ſome who rather believe it to be the modern Sumatra. The ancients had alſo ſome obſcure knowledge of the peninſula of Malacca, which they called the *Golden Cherſoneſus*, and they ſeem to have examined the gulf formed by that land, which is now the gulf of Cochin China, or commonly called the *gulf of Tonkin*. It is ſomewhat extraordinary that they do not ſeem to have been acquainted

Hiſtory. quainted with Java, Borneo, and that numerous group of iſlands which form, in that quarter, the greateſt Archipelago in the world. It is equally ſingular that the Maldives had eſcaped the obſervation of theſe navigators. This ſeems to prove that they never ventured out into the open ſea, but kept cloſe along the ſhore. Ptolemy indeed ſays, that his iſland of Taprobana was ſurrounded with many hundreds of ſmaller iſlands, to ſome of which he gives names; but all this is involved in impenetrable obſcurity.

29 Africa. Of Africa, the ancients knew only thoſe parts which lay along the coaſt, and to a very ſmall diſtance inland, if we except Egypt, with which they were well acquainted, at leaſt as far as the cataracts of the Nile, and a little beyond them, as far as the iſland of Meroë, towards the 20th degree of north latitude. Their knowledge of the coaſts of Africa on the ſide of the Red ſea, extended no farther than the ſhores of that ſea, except that part which was dependent on Egypt; the interior of the country being inhabited by ferocious and untractable people. They were ſtill leſs acquainted with the countries which lay beyond the ſtrait, and Ptolemy appears to have given no credit to the navigators who were ſaid to have ſailed round that part of the world, for he has left the continent of Africa imperfect towards the ſouth. Strabo and Pomponius Mela were, however, decidedly of opinion that Africa was a peninſula, and that it was joined to the reſt of the continent only by that narrow neck of land which is now called the iſthmus of Suez. The ancients ſeem to have had no knowledge of that large and beautiful iſland of Madagaſcar, unleſs we ſuppoſe that Ptolemy had ſome imperfect acquaintance with it, under the name of the iſland *Menuthius*. The coaſt of Africa upon the Mediterranean ſea, was once covered with towns, dependent on the Roman empire, flouriſhing and poliſhed, while it preſents at preſent nothing but a neſt of pirates, whom the jealouſy of the great commercial nations ſupports, to the diſgrace and prejudice of civilized ſtates. Proceeding from the ſtraits of Gadez or Gibraltar, they had become acquainted with the coaſt as far as a cape which they called *Heſperion-Keras*, probably the modern Cape de Verd, or the cape that lies a little to the weſt of it, though in the maps of Ptolemy it is thrown a little back inland. The Fortunate iſlands, or the Heſperides, at preſent the Canaries, better known by fame than in reality, ſeem to have been the boundaries of ancient geography to the weſt, as the Seres and Sinæ were to the eaſt. It appears, however, that the Cape de Verd iſlands were not entirely unknown to the ancients, and they are probably the ſame with what were then called the Gorgades or Gorgones, which were ſuppoſed to be two days ſail to the weſt of Heſperion-Keras.

30 "There is little doubt (ſays Mr Patteſon) concerning the names by which moſt of the principal countries of Europe were known to the ancients; nor is there any difficulty in diſpoſing the chief nations, which ancient writers have enumerated in the ſouth-weſt part of Aſia or on the African coaſt of the Mediterranean; but with the north and north-eaſt parts of Europe, about two-thirds of Aſia towards the ſame quarters, and nearly the ſame proportion of Africa towards the ſouth, they appear to have been wholly unacquainted. Of America they did not even ſuſpect the exiſtence; and if it ever happened, as ſome writers have imagined, that Phœnician merchant ſhips were driven by ſtorms acroſs the Atlantic to the American ſhores, it does not appear that any of them returned from thence to report the diſcovery. Hiſtory.

"The names of provinces, ſubdiviſions, and petty tribes, mentioned by ancient authors, in thoſe countries which were the chief ſcenes of Roman, Grecian, or Iſraelitiſh tranſactions, are almoſt as numerous as in a modern map of the ſame countries; and the ſituations of many of them can be very nearly aſſigned: but the limits of each, or indeed of the ſtates or nations to which they belonged, can, in very few inſtances, be preciſely fixed. Thus the ſouthern boundaries of the Sarmatæ in Europe, cannot be aſcertained within a degree at the neareſt; and in France, neither the limits of the people called the Belgæ, Celtæ, and Aquitani; nor thoſe of the Roman diviſions, viz. Belgica, Lugdunenſis, Aquitania, Narbonenſis, and the Province, can be laid down, in many places, but by a hardy conjecture. The ſame obſervation may be juſtly applied to the Tarraconenſis, Luſitania, and Betica of Spain; to the Cauci, Catti, Suevi, &c. of Germany; and, above all, to the Britannia prima et ſecunda, and other diviſions of the Roman government in Britain: of which not only the limits, but the ſituations are ſtill in diſpute*." *Patteſon's *Atlas*, Part 1. page 27.

31 Geography of the middle ages. During the middle ages geography, as well as moſt other arts and ſciences, ſeems rather to have gone backwards than advanced. The weakneſs of the Roman emperors, the relaxation of military diſcipline, the boundleſs paſſion for luxury and pleaſure, and the continual incurſions of the barbarous nations, while they contributed to haſten the fall of the weſtern empire, alſo accelerated the ruin of the arts. It ſeems as if theſe deſtructive hordes of barbarians, the Goths, the Huns, and the Vandals, had enveloped the whole world in one profound and univerſal ignorance. This darkneſs, which overſpread the whole of Europe, did not permit geography to make any advances for a very conſiderable time. There were indeed ſome navigators who inveſtigated countries that were ſtill little known, but they were ſo ignorant, that they afford us very little new light. There was one named Coſmas, who made a voyage to India, which procured him the name of Indo-Pleuſtes, and who gave an account of his voyage under the title of *Sacred Geography*. This man was ſo egregiouſly ignorant, as to believe that he had diſcovered that the earth was a plane, and that the diverſity of the ſeaſons, and the inequality of the days and nights, were owing to a very high mountain ſituated to the north, behind which the ſun ſet to a greater or leſs depth.

32 Diſcoveries of the Arabians. The voyages of the Arabians to the Eaſt Indies (ſee the hiſtory of COMMERCE), contributed to throw farther light on that extenſive part of the globe. Conquerors of the countries on the Red ſea, and enthuſiaſtic propagators of their religion, they carried their arms as far as the extremity of India. We ſee them in the 9th century extending to China; and Renaudot has publiſhed two of their narrations, in which we can trace with tolerable accuracy, the places viſited by their authors. The iſland of Serendib, ſo celebrated in their tales, is certainly the modern Ceylon; for *dib* or *dit*, in the Malay language, ſignifies *iſland*, ſo that Serendib, ſignifies the iſland of Seren or Selan. Farther, theſe

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relations do not give us as favourable an idea of the Chineſe as we derive from their own hiſtory; on the contrary, if we may believe theſe Arabian travellers, this people were, even at that time, in a ſtate not very civilized.

33 Modern diſcoveries.

We are now arrived at the modern period of our hiſtory, during which the moſt important diſcoveries have been made, and our knowledge of the habitable globe more than doubled. The diſcoveries and improvements during this period are ſo numerous, that it will be impoſſible to give here any thing more than a chronological view of the moſt remarkable, referring for a detailed account of them to the geographical and hiſtorical articles in this work.

The taſte for voyages of diſcovery began in Europe ſoon after the revival of literature in the 15th century, juſt before the commencement of which, namely, in the reign of Henry III. king of Spain, about the year 1395, the Canary iſlands were more fully ſurveyed than at any former period.

1415. Prince Henry III. ſon of John king of Portugal, ſailed round the coaſt of Africa.

1417. The Canary iſlands were ſubdued by Bethancourt, nephew of the admiral of France.

1420. The iſland of Madeira was examined by John Gonſalvo and Triſtan Vaz, two Portugueſe.

1446. Cape de Verd was diſcovered by Dennis Fernandez.

1487. The Cape of Good Hope was diſcovered by Barthelemi Diaz. The diſcovery of this cape led the way to that of the new world. This great event, which gave a new flight to the genius of mankind, is one of the moſt important in the hiſtory of geography. A particular account of this diſcovery will be found under the article AMERICA. The following are the dates of the principal geographical diſcoveries which have taken place between that of Columbus, and the voyages of our celebrated navigator Cook.

1496. Florida, by Sebaſtian Gabot, an Engliſhman.
1498. The Indies, by Vaſco di Gama.
1499. The river of Amazons, by Yanez Pinçon.
1500. Brazil, by Alvarez Cabral, a Portugueſe.
1504. Newfoundland, by ſome Normans.
1518. Mexico, by Ferdinand Cortes
1519. The ſtraits of Magellan, South ſea, and Phillippine iſlands, by Ferdinand Magellan.
1525. Canada, by Jean Verrazan, a Florentine, ſent by Francis I. of France.—Peru, by F. Pizarro of Spain.
1527. New Guinea, by Alvaro de Salvedra.
1534. Chili, by Diego Almagro.
1535. California, by Ferdinand Cortes.
1567. The iſlands of Solomon, by Alvaro de Mendoza.
1618. New Holland, by Zechaen.
1642. Van Dieman's land, by Abel Janſen Taſman.
1643. Brower's land.
1654. New Zealand.
1678. Louiſiana, by Robert Cavelier de Laſalle, governor of Frontiniac.
1700. New Britain, by Dampier, an Engliſhman.
1739. Cape Circumciſion, conteſted between the French and Engliſh. Said by Montucla to be diſcovered by two French veſſels.
1767. The iſland of Taiti, by Wallis, an Engliſhman.
1778. The Sandwich iſlands, by Cook.

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Within this period there are reckoned 25 voyages round the world, viz. thoſe of Magellan, Drake, Cavendiſh, Noort, Spilburg, Lemaire, L'Hermite, Clepington, Carreri, Shelvack, Dampier, Cowley, Woodes Rogers, Le Gentil, Anſon, Wallis, Roggewein, Bougainville, Sarville, Dixon, three voyages of Cook, La Peyrouſe, Marchand, Vançouver, and Pages.

34 Number of voyages round the world.

Within theſe few years, very conſiderable light has been thrown on the ſtate of our geographical knowledge, by ſeveral valuable voyages and travels that have lately appeared. The diſcoveries that have been ſucceſſively made in the great South ſea, and in other parts of the world, eſpecially the extenſive iſland of New Holland, are now ſo fully eſtabliſhed, as to add conſiderably to the certainty of our geographical knowledge; and the voyages of Cook, La Peyrouſe, and Vancouver, have afforded us more exact ſurveys of the coaſts of theſe countries than we could, ſome years ago, have dared to hope for. The accounts of the late embaſſies to China, Tibet and Ava, afford many authentic materials for a modern ſyſtem of geography, the place of which muſt have been ſupplied by more remote and doubtful information. From the latter of theſe accounts we are become familiarly acquainted with an empire (that of the Birmans), which a ſhort time ago was ſcarcely known (ſee ASIA, 81—152.). Our knowledge of Hindoſtan and the neighbouring countries has been greatly extended by the reſearches of the Aſiatic Society, and ſome other late works; while our acquaintance with the interior of Africa has been rendered leſs imperfect by the exertions of the African Society, and by the travels of Park, Brown, and Barrow; and the northern boundaries of America, even as far as the ſea which appears to ſurround the northern extremity of that vaſt continent, have been more fully diſcloſed by the journeys of Hearne and Mackenzie. 35

The late voyage of Turnbull, however inſignificant it may be in other reſpects, has at leaſt the merit of enlarging our knowledge of the manners and political tranſactions of the South ſea iſlanders, and of introducing to our acquaintance, in the perſon of Tamahama, the chief of Owhyhee, a ſovereign, who, in ambition and deſire of improvement, bids fair to vie with Peter the Great; and to transform a nation of ſavages, to a civilized people.

36 Preſent defects of geography.

With all the advantages which geography has lately received, the ſcience is ſtill far from being perfect; and the exclamation which D'Anville is ſaid to have made in his old age, "Ah! mes amis, il y a bien d'erreurs dans la geographie"—*Ah! my friends, there are a great many errors in geography*, may ſtill be applied with conſiderable juſtice. Many points in the ſcience have been but very lately aſcertained. Thus, the extent of the Mediterranean ſea was almoſt unknown at the beginning of the 17th century, although it is now almoſt as exactly aſcertained as that of any country in Europe. In a book publiſhed by Gemma Friſius, *de orbis diviſione*, in 1530, we find the difference of longitude between Cairo in Egypt and Toledo in Spain ſtated at 53° inſtead of 35°, and other meaſures of extent are proportionally erroneous. Not many years ago there was an uncertainty with reſpect to the extremity of the Black ſea and the Caſpian, to the amount of 3° or 4°; and

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and so lately as the year 1769, the longitude of Gibraltar and of Cadiz was not known within half a degree.

Many parts of the geography of Europe are still very defective; Spain and Portugal have been but imperfectly explored, and European Turkey is still less known. It may appear extraordinary that we have yet no correct chart of the British channel, though we are assured by Major Rennel that this is the case; and it has been proved by the trigonometrical surveys of Britain that have yet been published, that there are many gross errors in our best county maps. We have had occasion to remark that geography has sometimes been retrogressive, and there cannot be a greater proof of the truth of the observation, than that in a map of the Shetland islands, published not long ago, by Preston, they are represented as too large by one third, both in length and breadth, and their relative positions are very inaccurate, though in the maps of the same islands published before the year 1750, they are laid down with much greater accuracy, as appears from surveys made by order of the late king of France, and from the maps published by Captain Donelly, and at Copenhagen, in the year 1787.

In Asia we are imperfectly acquainted with Tibet, and some other central regions; and even Persia, Arabia, and Asiatic Turkey, are but little known. Of Australasia, or New Holland, and New Guinea, almost nothing is known except the coasts, and a great part of them towards the south has been but imperfectly explored. Of Polynesia, or the numerous islands in the South Pacific ocean, we are also very ignorant; and in the Pacific ocean, particularly towards the south pole, many discoveries probably remain to be made.

Our ignorance of the central parts of Africa is notorious, and the improvement of our geographical knowledge in that quarter has, for some years, been a favourite object. It may admit of doubt, however, whether this object will be speedily attained, as the obstacles to investigation in those inhospitable tracts, seem nearly insurmountable by human prudence and courage. Even the shores of Africa have not been completely surveyed, especially those towards the south and east.

America has of late been much more fully explored than at any former period: but still the western parts of North America, and the central and southern regions of South America are very little known; and the Spanish settlements towards the north are scarcely known, except to their own inhabitants.

The science of geography will probably be never perfectly understood, as, besides the numerous obstacles which oppose the progress of the traveller, it is scarcely possible that exact trigonometrical surveys of every place and country, the only certain method of ascertaining their exact situations and relative positions, can be made.

Political geography must ever remain the most uncertain part of the science. New changes are perpetually taking place in the relations of neighbouring states, according as ambition, tyranny, or commercial convenience dictates. Territory is transferred, by cession or by conquest, from one nation to another. Whoever will compare the relations of the European states, as they appear in the present maps, and in those published half a century ago, will scarcely recognise the countries to be the same. The great divisions indeed remain as before, but the boundaries of most of them are entirely changed. A number of independent states, and in one instance, a large kingdom, have been swallowed up by the unjustifiable ambition of their more powerful neighbours, and their names may be blotted from the map of Europe. The republics of Holland, of Switzerland, of Venice, are no more: the kingdoms of Poland and Sardinia have ceased to exist; the successor of St Peter, who once gave laws to princes, and governed Europe with unbounded sway, is now a wretched exile, and his dominions are doomed to increase the already overgrown power of despotic upstarts. Whether the present generation of emperors and kings, erected by the mighty Napoleon, will remain as long as did the states on whose ruins they have been raised, or are rather ephemeral productions, doomed to perish at the setting of that sun which now gives them live and vigour, is a question which future experience alone can determine.

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The limits prescribed to this article do not permit us to enter on a critical examination, or even a characteristic sketch of the geographical works that have appeared in the modern period of the history of the science; and a bare enumeration of names would be equally tiresome and uninteresting. Some of the best modern works will be mentioned in the sequel; at present we shall conclude this Part in the words of an able judge of the present state of the science.

"The Spaniards and Italians (says Mr Pinkerton) have been dormant in this science; the French works of La Croix and others are too brief; while the German compilations of Busching, Fabri, Ebeling, &c. are of a most tremendous prolixity, arranged in the most tasteless manner, and exceeding in dry names, and trifling details, even the minuteness of our gazetters. A description of Europe in 14 quarto volumes, may well be contrasted with Strabo's description of the world in one volume: and geography seems to be that branch of science, in which the ancients have established a more classical reputation than the moderns. Every great literary monument may be said to be erected by compilation, from the time of Herodotus to that of Gibbon, and from the age of Homer to that of Shakespeare; but in the use of the materials there is a wide difference between Strabo, Arrian, Ptolemy, Pausanias, Mela, Pliny, and other celebrated ancient names, and modern general geographers; all of whom, except d'Anville, seem under graduates in literature, without the distinguished talents or reputation, which have accompanied almost every other literary exertion. Yet it may safely be affirmed, that a production of real value in universal geography requires a wider extent of various knowledge than any other literary department, as embracing topics of the most multifarious description, There is, however, one name, that of d'Anville, peculiarly and justly eminent in this science; but his reputation is chiefly derived from his maps, and from his illustrations of various parts of ancient geography. In special departments Gossellin, and other foreigners, have also been recently distinguished; nor is it necessary to remind the reader of the great merit of Rennell and Vincent in our own country *." * *Pinkerton's Geography*, p. 8.

PART

PART II. PRINCIPLES AND PRACTICE OF GEOGRAPHY.

CHAP I. *Of the Surface and General Diviſions of the Earth.*

38

IT has been ſuppoſed, by the leſs enlightened part of mankind in all ages, that the ſurface of the earth is nearly a plane, bounded on all ſides by the ſky. It was ſhewn, however, in the article ASTRONOMY, (N° 269—272.) that the earth is of a ſpherical figure, and an account was there given of the manner in which the true form of it was determined. Independently of the conſiderations there detailed, the ſpherical figure of the earth may be inferred, in a popular view, from the following facts.

39 Proofs of the ſpherical form of the earth.

1. When we ſtand on the ſea-ſhore while the ſea is perfectly calm, we eaſily perceive that the ſurface of the water is not quite plain, but convex or rounded; and if we are on one ſide of a broad river or arm of the ſea, as the frith of Forth, and with our eyes near the water, look towards the oppoſite coaſt, we ſhall plainly ſee the water elevated between our eyes and the oppoſite ſhore, ſo as to prevent our ſeeing the land near the edge of the water.

2. When we obſerve a ſhip leaving the ſhore, and going out to ſea, we firſt loſe ſight of the *hull*, then of the ſails and lower rigging, and laſtly of the upper part of the maſts. Again, when a ſhip is approaching the ſhore, the firſt part of her that is ſeen from the land is the topmaſt, then the ſails and rigging appear, and laſtly the hull comes gradually into view. Theſe appearances can ariſe only from the ſhip's ſailing on a convex ſurface; as, if the ſurface of the ſea was plain, a ſhip on its firſt appearance would be viſible, though very ſmall in all its parts at the ſame time, or rather the hull would firſt appear, as being moſt diſtinguiſhable; and, in going out of ſight, it would in the ſame manner diſappear at once, or the hull would be the laſt part of which we ſhould loſe ſight.

3. Many navigators ſent on voyages of diſcovery, have, by keeping the ſame courſe, at length arrived at the port from which they ſet out, having literally ſailed round the globe. This could not happen if the ſea were a plain.

4. When we travel to a conſiderable diſtance, in a direction due north or due ſouth, a number of new ſtars ſucceſſively appear in the heavens, in the quarter to which we are travelling; while many of thoſe in the oppoſite quarter gradually and ſucceſſively diſappear, and are ſeen no more till we return in a contrary direction.

5. In an eclipſe of the moon, which has been ſhown (ASTRONOMY, N° 199.) to be owing to the obſcuration of the moon's ſurface by the ſhadow of the earth, the boundary of the obſcured part of the moon is always circular. Now, it is evident that no body, which is not ſpherical, can, in all ſituations, caſt a circular ſhadow.

40 Magnitude of the earth.

The diameter of the earth is generally computed at 7958 miles, though Mr Vince makes it 7930, nearer the medium derived from a compariſon of the polar with the equatorial axis. Taking this laſt, therefore, as the mean diameter, the circumference will be $=24,912$ miles, and conſequently the extent of the ſuperfices will be $=197,552,160$ miles, of which it is computed that at leaſt two-thirds are covered with water.

In the above computation no account is taken of the mountains and other eminences on the ſurface of the globe; for, although theſe are of conſiderable conſequence in a geographical point of view, as they conſtitute the moſt natural and remarkable boundaries of countries, and by their influence on the ſoil and climate of the different regions, contribute in a great degree to form thoſe ſhades of diſtinction which diverſify the inhabitants of the ſeveral quarters of the earth, they are, howevever, too trifling when compared with the diameter of ſo great a body, to make any ſenſible error in the calculation.

41 Diviſions of the earth.

The ſurface of the earth is exceedingly diverſified, almoſt everywhere riſing into hills and mountains, or ſinking into valleys; and plains of any great extent are extremely rare. Among the moſt extenſive plains, are the ſandy deſerts of Arabia and Africa, the internal part of European Ruſſia, and a tract of conſiderable extent in the late kingdom of Poland, now called Pruſſian Poland. But the moſt remarkable extent of level ground, is the vaſt platform of Tibet in Aſia, which forms an immenſe table, ſupported by mountains running in every direction, and is the moſt elevated tract of level country on the globe. The chief elevations or mountains that occur, with their elevation, &c. will be mentioned under GEOLOGY. The greateſt concavities of the globe are thoſe which are occupied by the waters of the ſea, and of theſe by far the largeſt forms the bed of the Pacific ocean, which ſtretching from the eaſtern ſhores of New Holland to the weſtern coaſt of America, covers nearly half the globe. The concavity next in ſize and importance, is that which forms the bed of the Atlantic ocean, extending between the new and the old worlds; and a third concavity is filled by the Indian ocean. Smaller collections of water, though ſtill large enough to receive the name of oceans, fill up the remaining concavities, and take the names of Arctic and Antarctic oceans.

42 Oceans.

43 Seas.

Smaller collections of water that communicate freely with the oceans, are called *ſeas*, (vid. A; fig. 1.), and of theſe the principal are the Mediterranean, the Baltic, the Black ſea, and the White ſea. Theſe ſeas ſometimes take their names from the country near which they flow; as the Iriſh ſea and the German ocean. Some large bodies of water which appear to have no immediate connexion with the great body of waters, being everywhere ſurrounded by land, are yet called *ſeas*; as the Caſpian ſea. Plate CCXXX.

44 Bays or gulfs.

A part of the ſea running up within the land, ſo as to form a hollow, if it be large, is called a *bay* or *gulf*; as the bay of Biſcay, gulf of Mexico: if ſmall, a *creek*, *road*, or *haven*.

45 Straits.

When two large bodies of water communicate by a narrow paſs between two adjacent lands, this paſs is called

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called a *ſtrait*, or *ſtraits* (C, fig. 1.) as the ſtraits of Gibraltar, the ſtraits of Dover, of Babelmandel, &c. The water uſually flows through a ſtrait with conſiderable force and velocity, forming what is called a current, and frequently this current always flows in the ſame direction. Thus, in the ſtraits of Gibraltar there is a conſtant current from the Atlantic into the Mediterranean, though the ſurface of the latter never ſeems to be elevated beyond its uſual level. There is always a current round Cape Finiſterre and Cape Ortegal, ſetting into the bay of Biſcay, and it has been diſcovered by Major Rennel, that this current is continued in a direction N. W. by W. from the coaſt of France to the weſtward of Ireland and the Scilly iſlands. Hence he draws this uſeful practical inſtruction for navigators who are entering the Engliſh channel from the Atlantic, viz. that they ſhould keep no higher latitude than 48° 45′, leſt they ſhould be carried by the current upon the rocks of Scilly. For want of this neceſſary precaution, it is ſaid that many ſhips have been loſt on theſe rocks.

46 Currents.

47 Lakes.

A body of freſh water, entirely ſurrounded by land, is called a *lake*, *loch*, or *lough* (as D, fig. 1.), with the exception of the ſea above mentioned; as the lake of Geneva, Lake Ontario, Lake Champlain, Loch Lomond, &c.

This term, or its ſynonimes, loch or lough, is ſometimes applied to what is properly a gulf or inlet of the ſea, as Loch Fyne in Scotland, and Lough Swilly in Ireland.

48 Rivers.

A conſiderable ſtream of water riſing inland, and running towards the ſea, is called a *river;* a ſmaller ſtream of the ſame kind is called a *rivulet* or *brook*. Vid. E, fig. 1.

49 Continents.

The great extent of land which forms the reſt of the globe, is divided into innumerable bodies, ſome of which are very large, but the majority extremely ſmall. There are three very extenſive tracts of country, which may all be denominated continents, though only two of them have hitherto been diſtinguiſhed by that appellation. The moſt conſiderable of theſe continents is what has been called *the old world*, compriſing Europe, Aſia, and Africa. The ſecond comprehends North and South America, or what has been denominated *the new world*, and is little inferior in extent to the former. The third great diviſion forms the country called New Holland.

50 Iſlands.

A body of land entirely ſurrounded by water is called an *iſland*, (vid. *a*, fig. 1.) as Britain, Ireland, Jamaica, Madagaſcar, &c. According to the ſtrict meaning of this definition, the large diviſions juſt mentioned are iſlands; for it is almoſt certainly aſcertained, that the continent of North America is everywhere bounded by the ſea, and it has long ceaſed to be doubtful that New Holland is in the ſame circumſtances, and it is generally called the largeſt iſland in the world. But perhaps it would be better to confine the term to thoſe numberleſs ſmaller iſlands that appear above the ſurface of the waters. When a number of ſmaller iſlands are ſituated near each other, the whole aſſemblage is commonly called a group of iſlands, as *b*, *b*. The large aſſemblages of iſlands that have been diſcovered in the South Pacific ocean, have lately been comprehended under the name of Polyneſia, conſtituting a ſixth diviſion of the whole earth; the other five being Europe, Aſia, Africa, America, and the iſlands of New Holland and New Guinea, under the name of Auſtralaſia.

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A body of land that is almoſt entirely ſurrounded by water is called a *peninſula*, as *c*, fig. 1.; as the peninſula of Malacca, the Morea, or Grecian Peloponneſus, &c. Indeed the continent of Africa may be conſidered as a vaſt peninſula, being united to Aſia only by the ſmall iſthmus of Suez.

51 Peninſula.

52 Iſthmus.

The narrow neck of land which joins a peninſula to the main land, or which connects two tracts of country together, is called an *iſthmus*, as *d*. The moſt remarkable iſthmuſes are the iſthmus of Darien, connecting the continents of North and South America, and the iſthmus of Suez, joining Africa to Aſia.

53 Promontory and Cape.

A narrow tract of land ſtretching far out into the ſea, being united to the main land by an iſthmus, is called a *promontory*, and its extremity next the ſea, is called a *cape*, as *e f*, fig. 1. The moſt remarkable capes are the Cape of Good Hope, at the ſouthern extremity of Africa; Cape Horn at the ſouthern extremity of South America; the North Cape at the northern extremity of Europe; and Cape Talmara, at the northern extremity of Aſia.

It may aſſiſt the memory of the young geographer, to compare together the above diviſions of land and water. We may remark that the large bodies of land, called continents, correſpond to the extenſive tracts of water called oceans; that iſlands are analogous to lakes; peninſulas to ſeas or gulfs; iſthmuſes to ſtraits; promontories to creeks, &c.

The inhabited parts of the earth are calculated to occupy a ſpace of 38,990,569 ſquare miles, of which the four quarters into which the globe is uſually divided are ſuppoſed to have the following proportions:—

Europe,	4,456,065
Aſia,	10,768,823
Africa,	9,654,807
America,	14,110,874

The whole population of the earth has been computed at 700,500,000 ſouls; and of theſe

Aſia is ſuppoſed to contain	500,000,000
Europe,	150,000,000
Africa,	30,000,000
America,	20,000,000
and Auſtralaſia and Polyneſia, &c.	500,000

Hence the proportional number of inhabitants to every ſquare mile in each quarter is as follows:—

In Aſia	46	
Europe	34	
Africa	3	
America	3	to every two ſquare miles.

Chap. II. *Of the Conſtruction and Uſe of the Globes.*

Sect. I. *Deſcription and Uſe of the Terreſtrial Globes.*

54 Nature of the globes.

For the purpoſe of repreſenting more accurately the globe which we inhabit, geographers have long had recourſe to ſpherical balls, on the face of which are drawn the various diviſions of the earth, and which are fitted up with ſuch an apparatus, as enables us to illuſtrate and explain the phenomena produced by the motions

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tions of the earth, and the different ſituations of its various inhabitants. The ball thus prepared, is called an *artificial globe*, and what we have deſcribed is properly the *terreſtrial globe*, ſo called to diſtinguiſh it from another of a ſimilar form, and furniſhed in a ſimilar manner, but the ſurface of which repreſents the various aſſemblages of ſtars or conſtellations that appear in the heavens, and therefore this is called the *celeſtial globe*.

55 Circles on the globes.

In order to aſcertain the relative poſitions of places and countries on the earth, certain circles are ſuppoſed to be drawn on its ſurface, analogous to thoſe which were mentioned in ASTRONOMY, as ſuppoſed to be drawn in the heavens. As theſe circles are really repreſented on the artificial globes, it will be proper here to conſider a little more particularly their nature and uſes.

56 Axis and poles.

As the earth turns about on an imaginary axis, once in 24 hours, the artificial globe is furniſhed with a real axis, formed by a wire paſſing through the centre, and on which the globe revolves. The two extremities of this axis are its poles, the one being called the *north*, and the other the *ſouth pole*.

57 Equator or equinoctial.

A great circle drawn on the globe, at an equal diſtance from both poles, is the equator or equinoctial line, and repreſents on the globe a ſimilar circle, ſuppoſed to be drawn round the earth, and diſtinguiſhed by the ſame names. By ſailors this is commonly called the *line*, and when they paſs over that part of the water, where it is imagined to be drawn, they often make uſe of various ſuperſtitious ceremonies. The two parts of the globe into which it is divided by the equator, are called the *northern and ſouthern hemiſpheres*.

The equinoctial line on the earth paſſes through the middle of Africa, in the almoſt unknown territories of Macoco, and Monemugi, traverſes the Indian ocean, paſſes through the iſlands of Sumatra and Borneo, and the immenſe expanſe of the Pacific ocean; then extends over the province of Quito in South America, to the mouth of the river Amazons.

As every circle is ſuppoſed to be divided into 360°, ſo the equator is thus divided on the artificial globe.

58 Meridians.

Through every 15° of the equator there is drawn on the globe a great circle paſſing through the poles. Theſe circles are called *meridians*, becauſe when the ſun in his apparent courſe from eaſt to weſt reaches the correſponding circle in the heavens, it is noon on that part of the earth over which the meridian is ſuppoſed to paſs. Properly ſpeaking, every place on the earth has its own meridian, though to prevent confuſion, theſe circles are drawn on the artificial globe, only through every 15° of the equator. To ſupply the place of the other meridians, the globe is hung in a ſtrong brazen circle, which is called the *brazen meridian*, or ſometimes only the *meridian*. The brazen meridian, like the equator, is divided into 360°, but theſe are marked by nineties on each quandrant, being on one half of the meridian numbered from the equator to the poles, and on the other half from the poles to the equator. On the oppoſite ſide of the brazen meridian there are two concentric ſpaces, which are divided into degrees correſponding to the months and days of each month, the degrees being marked on concentric ſpaces from the north pole to about $23\frac{1}{2}$° both ways. The uſe of theſe diviſions will appear hereafter (B).

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59 Brazen meridian.

60 Parallels of latitude.

Through every tenth degree of the meridians, there are drawn on the globe circles parallel to the equator, which, for a reaſon that will appear preſently, are called *parallels of latitude*.

Before we proceed in deſcribing the other circles, &c. of the artificial globe, we ſhall here make a few remarks on the uſes of the equator, the meridians and parallels (C).

61 Of latitude and longitude.

The equator ſerves to meaſure the diſtance of one place from another, either to the eaſtward or weſtward, and this diſtance is called the *longitude* of the place. The meridians ſerve in like manner to meaſure the diſtance of one place from another in a direct line north or ſouth of the equator, and the diſtance of the place thus meaſured is called its *latitude*.

The longitude and latitude of places may be illuſtrated in the following manner. Let PEP′Q (fig. 3.) repreſent the earth or the globe, (ſuppoſed to be tranſverſe) whoſe axis is PCP′, the north pole being P, and the ſouth pole P′; and let EAQR repreſent a circle paſſing through the centre C, in a direction perpendicular to the axis PP′. This circle correſponds to the equator, and it divides the earth of the globe into two hemiſpheres, EPQ being the northern, and EP′Q the ſouthern hemiſphere. Let G, I, K, repreſent the ſituations of three places on the ſurface of the globe, through which let the great circles PKP′, PIP′, and PGP′, be drawn, interſecting the equator EQ, in *n*, *m*, *a*, reſpectively. The circles are the meridians of the places K, I, G. As every circle is ſuppoſed to be divided into 360°, there muſt be 90° from each pole to the equator. Hence the latitude of the place K is meaſured by the degrees of the arc intercepted between K and *n*, and the latitudes of G and I are meaſured by the degrees of the arcs intercepted between G and *a*, and I and *m* reſpectively. Theſe latitudes will be called north

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(B) The meridians are properly only ſemicircles, reaching from pole to pole, and of theſe there are twenty-four.

(C) In Geography, as in other ſciences, there are two methods of conveying inſtruction. One is, to lay down the principles of the ſcience firſt, and afterwards apply theſe to the practice of it; the other method is, to combine the principles and practice in one view. The former is uſually conſidered as the more ſcientific, but we are inclined to think that the latter is often to be preferred, as being leſs dry and tedious, eſpecially to a general reader. We have here, therefore, choſen to explain the nature of latitude and longitude, and the problems reſpecting them, before completing the deſcription of the globe. We ſhall proceed in the ſame manner, uniting, as far as poſſible, the principles and practice in one view. Making, therefore, the terreſtrial globe our text book, we ſhall thence explain the principles of geography, rather than detail theſe in a ſeparate ſection, and afterwards illuſtrate them by the globe.

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north latitudes, because the places lie in the northern hemisphere. Let there be two other places, WV, in the southern hemisphere; the latitude of W will be measured by the degrees of the arc intercepted between W and *a*; and the latitude of V by the arc intercepted between V and *m*; and these will be called south latitudes. Further, let the circle *c*, *e d*, *v*, G, be drawn parallel to the equator; this circle is called a parallel of latitude, and as it does not pass through the centre, it is evidently less than the equator, or it is a small circle. Now, all the arcs, such as R, *e*, *a*, G, &c. intercepted between the parallel and the equator, must be equal, since the circle is parallel to the equator; and hence every point in this parallel, or every place on the earth through which it is supposed to pass, has the same latitude.

Latitude is the same all over the earth, being constantly measured from the equator to the poles.

The longitude of a place is measured by the degrees of an arc of the equator, intercepted between some particular meridian, and the meridian passing through the place. Thus, suppose G to represent the particular meridian, and *m* to represent the place whose longitude is required; the longitude of *m* is measured by the arc *m a* of the equator, intercepted between *a*, the point where the meridian of G meets the equator, and *m* the point of the equator where it is cut by the meridian of the place *m*. The particular meridian from which we begin to reckon the degrees of longitude is called the *prime* or *first meridian*, and it is different in different countries.

The method of estimating the distances of places by longitudes and latitudes, is of considerable antiquity, and was employed by Eratosthenes, who first introduced a regular parallel of latitude, which began at the straits of Gibraltar, passed eastwards through the island of Rhodes to the mountains of India; all the intermediate places through which it passed being carefully noted. Soon after drawing this parallel through Rhodes, which was long considered with a degree of preference, Eratosthenes undertook to trace a meridian, passing through Rhodes and Alexandria, as far as Syene and Meroë. Pythias of Marseilles, according to Strabo, considering the island of Thule as the most western point of the then known world, began to count the longitude from thence, while Marianus of Tyre placed their first meridian at the Fortunate islands, or the Canaries; but they did not determine which was the westermost of these islands, and consequently which ought to serve as a first meridian. Among the Arabians, Alfragan, Albategnus, Nassir Eddin, and Ulug Beg, also reckoned from the Fortunate islands; but Abulfeda began to reckon his longitude from a meridian 10° to the eastward of that of Ptolemy, probably because it passed through the western extremity of Africa, where, according to him, were situated the pillars of Hercules; or because it passed through Cadiz, which was at that time rendered famous by the conquests of the Moors in Spain.

When the Azores were discovered by the Portuguese in 1448, some geographers made use of the island of Tercera as the first meridian. Other geographers, at Bleau, father and son, placed the first meridian at the Peak of Teneriffe, a mountain so far elevated above the sea, that it may be easily known by navigators; while others have made the island of St Philip, one of the Cape de Verds, the first meridian, because they conceived this to be the place where the magnetic needle had no variation. For a long time it was customary to reckon the longitude in most countries from the isle of Ferro, one of the Canary isles; but it is now customary for each nation to reckon the longitude, either from the metropolis of the country, or from the national observatory situated near it. Thus in France, Paris is the first meridian, and in Great Britain, the Royal Observatory of Greenwich. As in several good maps, the isle of Ferro is still used as a first meridian, it may be proper to remark, that the observatory at Greenwich lies 17° 45′ to the east of Ferro. Hence it is very easy to reduce the longitude of Ferro to that of Greenwich; for if the longitude required be east, we have only to subtract 17° 45′ from the longitude of Ferro, and the remainder is the longitude east from London; on the other hand, if the place be west from Ferro, we obtain the longitude west from London by adding to that of Ferro 17° 45′. If the place lies between Ferro and London, its longitude from London will be obtained by subtracting its longitude east from Ferro from 17° 45′. It is evident that by the reverse of this method, we may reduce the longitude from London to that of Ferro.

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62 Method of reducing longitudes to the same meridian.

In the diagram referred to above, if G represent the observatory of Greenwich, *a* will be the point from which we begin to reckon the degrees of longitude, and all places situated to the east of *a*, such as R, *m*, will have east longitude, while those situated to the west, as *n*, will have west longitude. In reckoning the longitude, we sometimes number the degrees only as far as 180°, but at other times they are numbered all round the equator from the point *a*; for instance 180°, till we come to *a* again; hence reckoning in the direction *a*, R, *m*, we should say that every place was in so many degrees east longitude, while if we reckon in the direction *n*, E, we should say that all the places had so many degrees west longitude all round the equator. To accommodate the globes to both these modes of reckoning the longitude, the equator is usually divided both ways, in a continued series from 0 at the first meridian to 360°.

It is evident, that as the parallels of latitude become smaller as they approach the poles, the arcs of these parallels intercepted between the same two meridians will be also smaller as we proceed from the equator to the poles, though in fact they consist of the same absolute number of degrees. Hence it will be easy to see that a degree of longitude must be smaller towards the poles than at the equator, and must become gradually smaller and smaller till we arrive at the poles, where it will be equal to nothing. Thus the arc G *v*. contains the same number of degrees as the arc *a*, *m*, though the former arc is much smaller than the latter. As a degree of longitude is therefore different at every degree of latitude, it becomes necessary to ascertain the relative proportion between the two; and for this purpose the following table has been constructed, which shews the absolute measure of a degree of longitude in geographical miles and parts of a mile for every degree of latitude, taking the degree of longitude at the equator, equal to 60 geographical miles.

TABLE I. *Shewing the length of a degree of longitude for every degree of latitude, in geographical miles.*

Lat.	Geo. miles.	Lat.	Geo. miles.	Lat.	Geo. miles.	Lat.	Geo. miles.	Lat.	Geo. miles.	Lat.	Geo. miles.
1	59.96	16	57.60	31	51.43	46	41.68	61	29.04	76	14.51
2	59.94	17	57.30	32	50.88	47	41.00	62	28.17	77	13.50
3	59.92	18	57.04	33	50.32	48	40.15	63	27.24	78	12.48
4	59.86	19	56.73	34	49.74	49	39.36	64	26.30	79	11.45
5	59.77	20	56.38	35	49.15	50	38.57	65	25.36	80	10.42
6	59.67	21	56.00	36	48.54	51	37.73	66	24.41	81	9.38
7	59.56	22	55.63	37	47.92	52	37.00	67	23.45	82	8.35
8	59.40	23	55.23	38	47.28	53	36.18	68	22.48	83	7.32
9	59.20	24	54.81	39	46.62	54	35.26	69	21.51	84	6.28
10	59.08	25	54.38	40	46.00	55	34.41	70	20.52	85	5.23
11	58.89	26	54.00	41	45.28	56	33.55	71	19.54	86	4.18
12	58.68	27	53.44	42	44.95	57	32.67	72	18.55	87	3.14
13	58.46	28	53.00	43	43.88	58	31.79	73	17.54	88	2.09
14	58.22	29	52.48	44	43.16	59	30.90	74	16.53	89	1.05
15	58.00	30	51.96	45	42.43	60	30.00	75	15.52	90	0.00

As it is often more convenient to eſtimate degrees of longitude in Engliſh ſtatute miles, we have added the following

TABLE II. *Shewing the length of a degree of longitude for every degree of latitude, in Engliſh ſtatute miles.*

Lat.	Eng. miles.	Lat.	Eng. miles.	Lat.	Eng. miles.	Lat.	Eng. miles.	Lat.	Eng. miles.	Lat.	Eng. miles.
0	69.2000	16	66.5192	32	58.6851	48	46.3038	64	30.3352	80	12.0166
1	69.1896	17	66.1760	33	58.0360	49	45.3994	65	29.2453	81	10.8250
2	69.1578	18	65.8134	34	57.3696	50	44.4811	66	28.1464	82	9.6306
3	69.1052	19	65.4300	35	56.6852	51	43.5489	67	27.0385	83	8.4334
4	69.0312	20	65.0265	36	55.9842	52	42.6037	68	25.9230	84	7.2335
5	68.9363	21	64.6037	37	55.2659	53	41.6453	69	24.7992	85	6.0315
6	68.8208	22	64.1609	38	54.5303	54	40.6751	70	23.6678	86	4.8274
7	68.6845	23	63.6986	39	53.7788	55	39.6917	71	22.5294	87	3.6219
8	68.5267	24	63.2177	40	53.0100	56	38.6959	72	21.3842	88	2.4151
9	68.3481	25	62.7167	41	52.2259	57	37.6891	73	20.2320	89	1.2075
10	68.1489	26	62.1963	42	51.4253	58	36.6705	74	19.0743	90	0.0000
11	67.9288	27	61.6579	43	50.6094	59	35.6408	75	17.9103		
12	67.6880	28	61.1001	44	49.7783	60	34.6000	76	16.7409		
13	67.4264	29	60.5237	45	48.9313	61	33.5489	77	15.5665		
14	67.1448	30	59.9293	46	48.0705	62	32.4873	78	14.3874		
15	66.8424	31	59.3162	47	47.1944	63	31.4161	79	13.2041		

63. Method of reducing degrees to miles, and *vice versa*.

Hence it appears that the degrees of latitude are all equal, and that a degree of longitude at the equator is equal to a degree of latitude, as each is $\frac{1}{360}$th of a great circle. In the ſecond of the above tables, a degree of longitude at the equator is eſtimated at 69.2 Engliſh miles, or about $69\frac{1}{4}$. The length of a degree in miles is uſually eſtimated at $69\frac{1}{2}$, but this is too much. Hence, to reduce degrees of latitude, and thoſe of longitude near the equator, to Engliſh miles, it is neceſſary to multiply them by 69.2, or, if great accuracy is not required, by 70.

64 Problems on latitude and longitude.

PROBLEM I. *To find the latitude and longitude of a given place.*

Bring the place below the graduated edge of the *brazen meridian*, and the degree of the meridian that lies immediately over the place is its *latitude*. Obſerve where the meridian cuts the equator, and that degree will be the *longitude* of the place.

Example. To find the latitude and longitude of Edinburgh.—Bringing Edinburgh below the meridian, we find over it nearly the 56th degree of north latitude (55° 58′), and the point where the meridian cuts the equator is nearly $3\frac{1}{4}$ (3° 12′ W. Long.) degrees weſt from London.

N. B. The longitude and latitude of places cannot be aſcertained exactly by the globes, as theſe are not calculated to ſhow the fractional parts of a degree; but they may be found with ſufficient correctneſs for ordinary purpoſes.

COROLLARY 1. The difference of latitude and longitude

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gitude between two places is found by subtracting the leſs from the greater, if they lie the ſame way, i. e. north or ſouth, caſt or weſt; or by adding the two together, if they lie in a different direction.

Cor. 2. Thoſe places that have the ſame latitude with any given place are found, by bringing the given place to the meridian, and obſerving what places paſs under the ſame degree, while the globe is turned round.

Cor. 3. Thoſe places which have the ſame longitude with a given place, are found by bringing the place to the meridian, and obſerving what other places lie under the graduated edge, while the globe is at reſt.

Problem II. *The latitude and longitude of a place being given, to find the place itſelf on the globe.*

Turn the globe till the given longitude comes under the brazen meridian; then mark the given latitude on the meridian, and immediately below it is the place required.

Example. What place is ſituated in 48° 23′ N. Lat. and 4° 29′ E. Long. from Greenwich? *Anſ.* Breſt in France.

65 Computation of longitude in time.

As the ſun, in his apparent motion round the earth, meaſures a great circle in about 24 hours, or in one hour paſſes over $\frac{1}{24}$th of ſuch circle, or 15°; it is evident that all places which lie 15° weſt of any meridian, muſt have noon or any other time of the day, an hour *later* than thoſe ſituated under that meridian; and that all places which lie 15° *eaſt* of any meridian, muſt have the ſame times of the day an hour *ſooner*. Hence, becauſe the meridians drawn on the globe make a difference of an hour each in the time of places, they are ſometimes called hour-circles; and the longitude of places is ſometimes reckoned in *time* as well as in *degrees*.

Degrees of longitude are reduced to hours and minutes, and *v. v.* by allowing an hour for every 15°, and four minutes for every degree.

66 Horary circles.

Though the meridians on the globe are ſometimes called *horary circles*, this name is generally confined to a ſmall braſs circle, which is adapted to one or each pole, and graduated into twice twelve hours; ſo that an index fixed to the axis, or the meridian, points out the ſeveral hours of day and night as the globe revolves.

In globes of the old conſtruction the hour circles are fixed on the outſide of the meridian, but this prevents the meridian from being moved quite round, which is required in ſome problems.

Mr Joſeph Harris, formerly aſſay-maſter of the mint, contrived an ingenious method of remedying this inconvenience. He placed two horary circles between the meridian and the globe, one at each pole, and they were fixed tightly between two braſs rollers, placed about the axis, ſo that when the globe was turned, they were carried round with it, while the edge of the brazen meridian ſerved as an index to cut the horary diviſions. A globe, thus furniſhed, ſerves univerſally and readily for performing problems in both northern and ſouthern latitudes; and alſo in places near the equator; whereas, in globes of the old conſtruction, the axis and horary circle prevent the brazen meridian from being moved quite round in the horizon.

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The conſtruction of the hour circles was rendered ſomewhat more ſimple by Mr G. Wright of London. In his globes, there are engraved two hour circles, one at each pole, on the map of the globe, each circle being divided into a double ſet of 12 hours, as in the uſual hour circles; but here the hours are numbered both to the right and left. (See fig. 4.). The hour hand, or index, is placed below the brazen meridian, in ſuch a way that it may be moved at pleaſure to any required part of the circle, and remain there ſufficiently ſteady during the revolution of the globe on its axis, being entirely independent of the pole. In this manner the motion of the globe round its axis, carrying the hour circle, the time is pointed out by the ſtationary index.

In the globes conſtructed by the late Mr George Adams, the equator is made to anſwer the purpoſe of an hour circle, by means of a ſemicircular wire placed in its plane, (ſee Q F, fig. 5.) and carrying two indices F, one on the eaſtern, the other on the weſtern, ſide of the brazen meridian. The method of uſing theſe indices will be ſhewn preſently. In theſe globes the equator is alſo marked with twice 12 hours, which increaſe from eaſt to weſt, the hours to the weſt of the firſt 12 being afternoon hours.

67 Problems relating to time.

Problem III. *The hour at any place being given, to find what hour it is at any other place.*

a, By the ordinary globes.

Bring the place at which the hour is given to the meridian, and ſet the index of the hour circle to the given hour. Then turn the globe till the other place comes under the meridian, and the index will now point to the hour required.

N. B. Where there is no index, the edge of the meridian will in both caſes point out the hour.

b, By Adams's globes.

The ſteps are here the reverſe of the former. Bring the place at which the time is required to the brazen meridian, and ſet the index to the given hour. Then turn the globe till the other place comes below the meridian, and the index will ſhew the time required.

N. B. In the ordinary globes, where the hour circle is uſually marked with two ſets of figures, it is proper, in performing this problem, to make uſe of that ſet which increaſes towards the right hand, obſerving that whichever XII. is fixed on for noon, the hours to the right or *eaſt* of this are hours P. M. and thoſe to the left or *weſt* are hours A. M. On Adams's globes the contrary of this takes place, from the hours being marked on the equator. They increaſe from eaſt to weſt, and, of courſe, thoſe to the eaſt of XII. are morning hours, and thoſe to the weſt of it afternoon hours.

Example 1. When it is noon at London, what hour is it in the Society iſles? *Anſ.* Two A. M.

Ex. 2. When it is 3 P. M. at Edinburgh, what hour is it at Delhi in Hindooſtan? *Anſ.* Thirty minutes paſt eight P. M.

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PROBLEM IV. *Having the hour at any place given, to find all thoſe places where it is noon.*

a, By the ordinary globes.

Bring the given place to the meridian, and ſet the index to the given hour. Then turn the globe till the index point to 12 at noon, and the places then under the meridian are thoſe required.

b, By Adams's globes.

Bring the given place to the meridian, and ſet the index to 12 at noon. Then turn the globe till the index ſhall point to the given hour; and all the places then under the meridian have noon at that time.

Ex. 1. It is now 30 min. paſt 10. A. M. at Edinburgh; In what places is it noon? *Anſ.* Near Stockholm; at Dantzic, Breſlaw, Preſburg, Vienna, Poſega, Raguſa, Tarento, and the Cape of Good Hope.

Ex. It is now midnight at London; Where is it noon? *Anſ.* In the north-eaſt parts of Aſia, in the middle of Fox iſles; at the Friendly iſles (nearly), and at the eaſt cape of New Zealand.

From the different ſituation of places with reſpect to latitude and longitude, the inhabitants of theſe places received from the ancients denominations that are ſtill retained.

63 Antœci. Thus, thoſe places which have the ſame longitude, or are ſituated under the ſame meridian, but are in oppoſite latitudes, the one lying as many degrees to the north of the equator as the other lies to the ſouth of it, are ſaid to be ANTOECI to each other. From this definition it is evident, that thoſe places ſituated under the equator have no *antœci*.

The appearances ariſing from the changes of the heavenly bodies are different in the oppoſite places. Thus, 1. The days of the one are equal to the nights of the other, and *vice verſa*; but they have noon, midnight, and all the other hours at the ſame time. 2. They have contrary ſeaſons at the ſame time: when it is ſummer at one place it is winter at the other, and ſo of ſpring and autumn. 3. The ſtars that never ſet at one place, never riſe at the other, and *vice verſa*.

69 Periœci. Again, thoſe places that have the ſame latitude, or are under the ſame parallel, but are in oppoſite longitudes, i. e. lie under oppoſite arcs of the ſame meridional circle, or 180° from each other, are ſaid to be PERIOECI to each other. Thoſe places which may be ſituated at the poles, have evidently no *periœci*.

The celeſtial appearances to the periœci are as follow. 1. The length of the day or night is the ſame to both places; but the hours, though diſtinguiſhed by the ſame numbers, are contrary; noon at the one being midnight at the other; and any hour in the forenoon at the one being the ſame of the afternoon to the other. 2. Both places have the ſame ſeaſons of the year at the ſame time. 3. The ſame ſtars that never riſe or ſet to one place, alſo never riſe or ſet to the other. 4. The heavenly bodies riſe in the ſame point of the horizon at both places, and continue for the ſame interval above or below it.

70 Antipodes. Laſtly, Thoſe places which are ſituated directly oppoſite to each other, by a diſtance equal to the diameter of the earth, are ſaid to be ANTIPODES to each other. If we conceive a line through the centre of the earth, and terminated in two points of its ſurface, theſe extreme points are antipodes to each other. Thus, the city of Lima in Peru is nearly the antipodes to Siam in the Eaſt Indies; and Pekin in China has for its antipodes Buenos Ayres in South America. Theſe places are always in oppoſite longitudes, and (except under the equator) in oppoſite latitudes.

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The celeſtial appearances to the antipodes are theſe. 1. The hours are contrary, as to the periœci. 2. The days of the one are of the ſame length with the nights of the other; hence the longeſt day to one is the ſhorteſt to the other, and *vice verſa*. 3. They have contrary ſeaſons at the ſame time. 4. Thoſe ſtars which, at one place are always above the horizon, are, to the other, always below it. 5. When the heavenly bodies are riſing at one place, they are ſetting at its *antipodes*, and *vice verſa*. For various opinions reſpecting the antipodes, ſee the article ANTIPODES.

The antipodes of any place are the periœci to the antœci of that place; and the antœci to their periœci. This will account for the method preſently deſcribed of finding the antipodes on the globe.

71 Problems. PROBLEM V. *To find the* antœci *to any given place.*

Bring the given place to the meridian, and thus aſcertain its latitude. Then count from the equator towards the oppoſite pole as many degrees as are equal to the latitude of the place; and the point where this reckoning ends is the place required.

Ex. 1. Where are the *antœci* to the Cape of Good Hope? *Anſ.* At Malta nearly.

Ex. 2. What people are the *antœci* to the inhabitants of Quebec in North America? *Anſ.* The inhabitants of Patagonia in South America.

PROBLEM VI. *To find the* periœci *of any given place.*

Bring the given place to the brazen meridian, and ſet the horary index to the upper XII. Then turn the globe till the index point to the lower XII. The place which is then below the meridian in the ſame latitude with that of the given place, is the ſituation required.

Ex. 1. Where are ſituated the *periœci* of Newcaſtle upon Tyne? *Anſ.* In the Aleouſki or Fox iſlands.

Ex. 2. Required the periœci to California in North America. *Anſ.* Near the mouth of the river Indus.

PROBLEM VII. *To find the* antipodes *to any given place.*

Find the *antœci* of the given place (by Problem V.) and then find the *periœci* of the latter (by Problem VI.). This laſt is the place required.

Ex. 1. It is required to find the antipodes of London. *Anſ.* The latitude of London is 51° 31′ N. the antœci to this, or 51° 31′ S. on the prime meridian, is in the ſouth Atlantic ocean; the periœci to this is in 180° W. Long. and 51° 31′ S. Lat. a little to the ſouth of the iſlands of New Zealand. The inhabitants of the ſouthern iſland of New Zealand are therefore the neareſt antipodes to London.

Several other circles beſides thoſe which we have mentioned are deſcribed on the artificial globe, and are ſuppoſed to be drawn on the earth. Theſe we ſhall now proceed to deſcribe, and explain their geographical uſes.

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The *Ecliptic* (ASTRONOMY, N° 43.) is a great circle drawn on the globe, croſſing the equator obliquely in two points, called the equinoctial points. (ASTRONOMY, N° 44.). This circle extends on each ſide of the equator to the latitude of 23° 28′, and is divided into 12 great parts correſponding to the 12 ſigns of the zodiac (ſee ASTRONOMY, N° 52.), and marked with their characters, and each ſign is ſubdivided into 30 degrees. The ecliptic has alſo its poles, which are two points that are diſtant 90° every way from the circle on each ſide. As the ecliptic declines from the equator 23° 28′, its poles are conſequently diſtant from thoſe of the equator, or of the globe, by the ſame meaſure. This circle properly belongs to the celeſtial globe, but as it is extremely uſeful in performing many geographical problems, it is always drawn on both globes, and requires to be noticed here, ſince it determines the poſition of ſeveral of the circles which we are about to mention.

72 The Ecliptic.

73 Tropics.

Through thoſe two points of the ecliptic, where it is at the greateſt diſtance from the equator, there are drawn on the globes two circles parallel to the equator, called *tropics*. That in the northern hemiſphere is called the *Tropic of Cancer*, as it paſſes through the ſign Cancer; and, for a ſimilar reaſon, that which is in the ſouthern hemiſphere is called the *Tropic of Capricorn*. The two points through which they are drawn are called *ſolſtitial points*. The imaginary line which correſponds to the tropic of Cancer on the earth paſſes from near Mount Atlas on the weſtern coaſt of Africa, paſt Syene in Ethiopia: thence, over the Red ſea, it paſſes to Mount Sinai, by Mecca the city of Mahomet, acroſs Arabia Felix to the extremity of Perſia, the Eaſt Indies, China, over the Pacific ocean to Mexico, and the iſland of Cuba. The tropic of Capricorn takes a much leſs intereſting courſe, paſſing through the country of the Hottentots, acroſs Braſil, to Paraguay and Peru.

74 Polar circles.

If the poles of the ecliptic be ſuppoſed to revolve about the poles of the earth, they will deſcribe two circles parallel to the equator, and 23° 28′ diſtant from it. Two ſuch circles are drawn on the globes, and are called *Polar Circles*, that in the north being called the *Arctic Polar Circle*, or merely the *Arctic Circle*, while that in the ſouth is called the *Antarctic Polar Circle*, or *Antarctic Circle*.

Both the tropics and the polar circles are marked on the globes by dotted lines, to diſtinguiſh them from the other parallels.

75 Colures.

The meridional circles that paſs through the equinoctial and ſolſtitial points are called *Colures;* the former being called the *Equinoctial* and the latter the *Solſtitial Colure*.

For an account of the variety of day and night in different parts of the globe, ſee ASTRONOMY, Part II. ch. i. ſect. 2.

76 Zones.

By means of the tropics and polar circles, the earth is ſuppoſed to be divided into five ſpaces, to which the ancients gave the name of *Zones*, or *Belts*. Thus the ſpace included between the two tropics was called the *Torrid Zone*, becauſe it was ſuppoſed to be ſo much heated or *roaſted* by the vertical ſun, which there prevails, as to be uninhabitable. The ancient terms are ſtill occaſionally uſed, but the countries between the tropics are now more commonly called the *Intratropical Regions*. The two ſpaces included between each tropic and its correſponding polar circle were called *Temperate Zones*, and were diſtinguiſhed according to their poſition into *Northern* and *Southern Temperate Zones*. Laſtly, The ſpaces between the polar circles and the poles were called the northern and ſouthern *Frigid Zones*, and were ſuppoſed uninhabitable from exceſſive cold. Theſe laſt are uſually denominated the *Polar Regions*.

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77 Countries between the tropics.

The countries lying between the tropics are the greater part of Africa, the ſouthern parts of Arabia, the eaſtern and weſtern peninſulas of India; all thoſe cluſters of iſlands lying between the ſouthern continent of Aſia and New Holland, called the Sunda, Molucca, Philippine, Pelew, Ladrone, and Carolina iſlands; the northern half of New Holland, New Guinea, New Britain; moſt of the groups of iſlands in the Pacific ocean, as the New Hebrides, New Caledonia, the Friendly and Society iſles, the Sandwich and Navigators iſles; the Weſt India iſlands; the greater part of South America; the Cape de Verd iſlands, and thoſe of St Helena, Aſcenſion, St Matthew, and St Thomas. See the map of the world in Plate CCXXXVI. or the plain chart in Plate CCXXXVII.

All places ſituated between the tropics have the ſun vertical twice in the year, at noon; but the time of the year when this happens is different in the different latitudes; at the equator, the ſun is vertical when he is in the equinoctial points, or when he has no declination. The inhabitants of the other *intratropical regions* have the ſun vertical when his declination is equal to their latitude, and on the ſame ſide of the equator. Thus, the inhabitants of New Caledonia, about 20° S. Lat. have the ſun vertical when his declination is 20° S. To illuſtrate this, it will be ſufficient to obſerve that, as the ecliptic is that circle in the heavens in which the ſun is ſuppoſed to move, the ſun's rays are perpendicular ſucceſſively to every point of the earth which lies below that point of the ecliptic in which the ſun happens to be, and he will therefore be vertical to all the places through which the ecliptic (continued to the earth) paſſes ſucceſſively.

78 Amphiſcii.

The inhabitants of the torrid zone have their ſhadows at noon day ſometimes to the ſouth, i. e. when the ſun's declination is north, and ſometimes to the north, i. e. when the ſun's declination is ſouth. They were therefore called by the ancients *Amphiſcii*, from αμφι, *about*, and σκια, *ſhadow*. See AMPHISCII and ASCII.

79 Countries in the temperate zone.

In the north temperate zone are ſituated the whole of Europe except Lapland; Barbary, and part of Egypt, in Africa; nearly the whole continent of Aſia; a great part of North America; the Azores, and the Canary and Madeira iſlands.

In the ſouth temperate zone lie the ſouthern part of Africa, the ſouthern half of New Holland, New Zealand, and the ſouthern part of South America.

In the temperate zones the ſun is never vertical, and the length of the days and nights differs much more than in the torrid zone.

80 Heteroſcii.

The inhabitants of theſe regions have their ſhadows at noon always in the ſame direction; thoſe in the north temperate zone having them directed to the north

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north, and thoſe in the ſouthern zone, towards the ſouth. They were hence called by the ancients *Heteroſcii*. See HETEROSCII.

81 Countries in the frigid zones.

The countries that are ſituated in the northern frigid zone, are Lapland, Spitzbergen, Nova Zembla, the northern parts of Aſia and America, and part of Greenland.

No land has yet been diſcovered within the ſouth polar circle, though it was long ſuppoſed that a large continent was ſituated there, which was called *Terra Auſtralis Incognita*. Our celebrated navigator Cook made many attempts to penetrate the icy fields which abound in theſe ſeas, in ſearch of this imaginary continent, but without ſucceſs, he having penetrated no farther than 72°. See COOK's *Diſcoveries*, N° 49. and 71.

Within the polar circles the ſun does not always riſe or ſet every 24 hours as in the other zones; but for a certain number of days in ſummer he never ſets, and for a certain number of days in winter he never riſes; the number of days during which the ſun is preſent or abſent increaſing from the polar circles to the poles, ſo that at the poles he never ſets for ſix months, nor riſes during a like period.

82 Periſcii.

When the ſun continues above the horizon more than 24 hours, the inhabitants of the polar regions have their ſhadows caſt all around them; and hence they have been called *Periſcii*. See PERISCII.

83 Climates.

The ancients did not employ regular parallels of latitude, but they divided the ſpaces between the equator and the poles into ſmall zones correſponding to the length of the longeſt day in each diviſion. To theſe ſubdiviſions they gave the name of climates, the ſituation and extent of which they determined in the following manner. As the day at the equator is exactly 12 hours throughout the year, but the longeſt day increaſes as we approach the poles, the ancients made the firſt climate to end at that latitude where the longeſt day was 12½ hours, which by obſervation they found to be in the latitude of 8° 25′. The ſecond climate extended to latitude 16° 25′, where the longeſt day is 13 hours, and thus a new climate extended, ſo as to divide the whole tract between the equator and the poles into 24 climates, in each of which the longeſt day was longer by half an hour than in that nearer the equator. The ſpace between the polar circles and the poles they divided into ſix climates, in each of which the length of the longeſt day increaſed by a month, till at the poles it was ſix months long. Hence, the 24 climates between the equator and the polar circles are called *Hour Climates*; and the ſix between the polar circles and the poles are called *Month Climates*. For further particulars reſpecting this ancient diviſion of the globe, and a table of the climates by Ricciolus, ſee CLIMATE. As the table given under that article is calculated only for the middle of each climate, and neither mentions the breadth of each, nor is extended to all the climates, we ſhall here ſubjoin one in which are given the latitude at which each climate terminates, its breadth in degrees, and the length of the longeſt day at the parallel terminating each.

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84 Table of climates.

HOUR CLIMATES.

Climates.	Latitude.	Breadth.	Longeſt Days.
I	8° 25′	8° 25′	12h 30m
II	16 25	8	13
III	23 50	7 25	13 30
IV	30 25	6 30	14
V	36 28	6 8	14 30
VI	41 22	4 54	15
VII	45 29	4 7	15 30
VIII	49 1	3 32	16
IX	52	2 57	16 30
X	54 27	2 29	17
XI	56 37	2 10	17 30
XII	58 29	1 58	18
XIII	59 38	1 29	18 30
XIV	61 18	1 20	19
XV	62 25	1 7	19 30
XVI	63 22	0 52	20
XVII	64 6	0 44	20 30
XVIII	64 49	0 43	21
XIX	65 21	0 32	21 30
XX	65 45	0 26	22
XXI	66 6	0 19	22 30
XXII	66 20	0 14	23
XXIII	66 28	0 8	23 30
XXIV	66 31	0 3	24

MONTH CLIMATES.

Climates.	Latitude.	Breadth	Longeſt Day.
I	67° 21′	50′	1 month.
II	69 48	2° 27	2
III	73 37	3 49	3
IV	78 30	5 8	4
V	84 5	5 35	5
VI	90	5 55	6

85 Places in the northern climates.

As the diviſion of the globe into climates, though now almoſt diſuſed, is of ſervice in ſhewing the length of the longeſt day in different countries, we ſhall here enumerate the principal places in each northern climate, theſe being beſt known and moſt intereſting.

I. The Gold and Silver Coaſts in Africa; Malacca in the Eaſt Indies; and Cayenne and Surinam in South America.

II. Abyſſinia in Africa; Siam, Madras, and Pondicherry, in the Eaſt Indies; the iſthmus of Darien; Tobago, the Grenades, St Vincent, and Barbadoes, in the Weſt Indies.

III. Mecca in Arabia; Bombay, part of Bengal, in the Eaſt Indies; Canton in China; Mexico and the bay of Campeachy, in North America; and Jamaica, Hiſpaniola, St Chriſtopher's, Antigua, Martinique, and Guadaloupe, in the Weſt Indies.

IV.

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IV. Egypt and the Canaries in Africa; Delhi, the capital of the Mogul empire, in Aſia; moſt of the gulf of Mexico, and Eaſt Florida, in North America; and the Havannah in the Weſt Indies.

V. Gibraltar; part of the Mediterranean ſea; the Barbary coaſt in Africa; Jeruſalem, Iſpahan, capital of Perſia, and Nankin, in China, in Aſia; and California, New Mexico, Weſt Florida, Georgia, and the Carolinas in North America.

VI. In Europe, Liſbon, Madrid, the iſlands of Minorca and Sardinia, and part of Greece or the Morea; in Aſia, Aſia Minor, part of the Caſpian ſea, Samarcand, Pekin, Corea, and Japan; and in North America, Maryland, Philadelphia, and Williamſburgh in Virginia.

VII. In Europe, the northern provinces of Spain, the ſouthern provinces of France, Turin, Genoa, Rome, and Conſtantinople; in Aſia, the reſt of the Caſpian, and part of Tartary; and in North America, Boſton and New York.

VIII. Paris and Vienna, in Europe; and New Scotland, Newfoundland, and Canada, in North America.

IX. London, Flanders, Prague, Dreſden, Cracow, in Europe; the ſouthern provinces of Ruſſia, and the middle of Tartary in Aſia; and the northern part of Newfoundland, in America.

X. Dublin, York, Holland, Hanover, Warſaw; the weſt of Tartary, Labrador, and New South Wales, in North America.

XI. Newcaſtle, Edinburgh, Copenhagen, and Moſcow.

XII. Southern part of Sweden; and Tobolſk in Siberia.

XIII. Stockholm; and the Orkney iſles.

XIV. Bergen in Norway, and St Peterſburgh.

XV. Hudſon's Straits in North America.

XVI. Moſt of Siberia; and the ſouthern parts of Greenland.

XVII. Drontheim in Norway.

XVIII. Part of Finland in the Ruſſian empire.

XIX. Archangel on the White ſea.

XX. Iceland.

XXI. Northern parts of Ruſſia in Europe, and Siberia in Aſia.

XXII. New North Wales, in North America.

XXIII. Davis's Straits, in North America.

XXIV. Samoieda in Aſia.

XXV. Northern parts of Lapland.

XXVI Weſt Greenland.

XXVII. Southern part of Nova Zembla.

XXVIII. Northern part of Nova Zembla.

XXIX. Spitzbergen.

XXX. Unknown.

The only parts of the terreſtrial globe that we have yet to deſcribe and illuſtrate are the *Quadrant of Altitude*, and the *Wooden Horizon;* and theſe it is neceſſary to explain, before we proceed to conſider the remaining problems performed with this globe.

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The *Quadrant of Altitude* is a thin flexible ſlip of braſs, graduated into 90°, and made to fix on any part of the brazen meridian by means of a nut and ſcrew. Round this nut it moves on a pivot, and by its flexibility may be applied cloſe to the ſurface of the globe. The quadrant of altitude is uſed to meaſure the diſtances of places from each other on the terreſtrial globe, and to aſcertain the altitudes of the ſun, ſtars, &c. on the celeſtial globe.

86 Quadrant of altitude.

To meaſure the diſtance between two places on the globe, nothing more is required than to ſtretch the graduated edge of the quadrant between them, and mark the number of degrees intercepted. Theſe reduced to geographical, or to Engliſh miles (by N° 63.) give the abſolute diſtance between the places. It is moſt convenient to bring one of the places to the zenith, which may be done by rectifying the globe for the latitude of that place as immediately to be explained, and then to ſtretch the quadrant to the other place, the diſtance marked, ſubtracted from 90°, gives the true diſtance in degrees. If the diſtance required be greater than 90°, it is proper to rectify the globe for the *antipodes* of the given places, and add the diſtance obſerved to 90°: the ſum is the diſtance required.

It has been very generally ſtated that the bearing of one of the places from the other may be found by obſerving, on the wooden horizon, in what point of the compaſs the quadrant of altitude, thus fixed in the zenith, cuts the horizon, This is conſidered by Mr Patteſon as a miſtake: "For (ſays he) ſuppoſing one of the places to lie due eaſt of the other, they are in the ſame parallel of latitude, and conſequently it is impoſſible that the prime vertical of either of them (that is, a circle cutting the eaſt and weſt points of the horizon), ſhould paſs through the other, unleſs they both lay under the equator. A line ſhewing the bearings of places is called a rhumb line. The lines of north and ſouth on the globe, being meridians, and thoſe of eaſt and weſt being parallels of latitude, are conſequently circles; but all the remaining rhumbs are a kind of ſpiral lines."

87 Wooden horizon.

The globes are ſupported by a wooden frame ending above in a broad flat margin, on which is paſted a paper marked with ſeveral graduated circles. This broad margin is called the wooden horizon, and repreſents the rational horizon of the earth, or the limit between the viſible and the inviſible hemiſpheres. On the paper with which the wooden horizon is covered, are drawn four concentric circles. The innermoſt of theſe is divided into 360 degrees, divided into four quadrants. The ſecond circle is marked with the points of the compaſs, i. e. the four cardinal points, eaſt, weſt, north, and ſouth (D), each being ſubdivided into eight parts or rhumbs, (ſee COMPASS). The circle next to that juſt mentioned contains the twelve ſigns of the zodiac, diſtinguiſhed by their proper names and characters; and

(D) The cardinal points of the compaſs are thus determined. The two points in which the meridian of any place when produced ſo as to paſs through the neareſt pole, cuts the horizon, (uſing this in an aſtronomical ſenſe, ſee ASTRONOMY,) are the north and ſouth points; the former being that point where the meridian firſt cuts the horizon in the *northern* hemiſphere, and the ſouth, that where it firſt meets the horizon in the ſouthern hemiſphere. Again, the two points where a great circle, paſſing through the zenith at right angles with the meridian, (and called

Principles and Practice. and each ſign is divided into 30 degrees. The laſt circle ſhews the months and days correſponding to each ſign.

This wooden ring can repreſent the rational horizon of any place marked on the terreſtrial globe only, when that place is ſituated in the zenith; and the method of bringing the place into this ſituation is called *rectifying the globe*.

88 To rectify the globe. PROBLEM VIII. *To rectify the globe according to the latitude of any place.*

Find the latitude of the place, (by Problem I.) and ſee whether it be north or ſouth. Then elevate the pole of the globe which is in the ſame hemiſphere with the latitude, as far above the wooden horizon as is equal to the latitude; bring the given place to the brazen meridian, and it will be in the zenith.

Example. To rectify the globe for the latitude of Edinburgh. The latitude of Edinburgh is 55° 58′ N. therefore raiſe the *north* pole 55° 58′ above the horizon, and bring Edinburgh below the braſs meridian.

It is for the purpoſe of more eaſily rectifying the globe, that one half of the brazen meridian is graduated from the poles to the equator; as, where this is not done, it is neceſſary to take the complement of the latitude, or the difference between it and 90°, which in ſome caſes requires a calculation.

The place being brought below the meridian, when the pole is elevated to the proper degree, it is evidently in the zenith, or 90° diſtant every way from the horizon. Thus, in the above example, if we count the degrees from that part of the meridian below which Edinburgh is ſituated, we ſhall find that they amount to 90° each way; for counting from Edinburgh along the meridian to the north pole, we have 34° 2′; which added to 55° 58′, the elevation of the poles, gives 90° on that ſide. Again, counting from the ſame point of the meridian towards the ſouthern part of the horizon, we have 55° 58′, as far as the equator, and 34° 2′ from thence to the horizon, making, as before, 90°, and as the graduated edge of the meridian is 90° both from the eaſtern and weſtern ſide of the horizon, Edinburgh, in this ſituation of the globe, is in the zenith.

89 Oblique ſphere. When either of the poles of the globe is thus elevated above the horizon, ſo as not to be in the zenith, the globe is ſaid to be in the poſition of an *oblique ſphere*, in which the equator and all its parallels are unequally divided by the horizon. This is the moſt common ſituation of the earth, or it is the ſituation which it has with reſpect to all its inhabitants, except thoſe at the equator and the poles. To the inhabitants of an oblique ſphere the pole of their hemiſphere is elevated above the horizon as many degrees as are equal to their latitude, and the oppoſite pole is depreſſed as much below the horizon, ſo that the ſtars only at the former are ſeen; the ſun and all the heavenly bodies riſe and ſet obliquely, the ſeaſons are variable, and the days and nights unequal. This poſition of the ſphere is repreſented at fig. 6. where the equator EQ, and the parallels cut the horizon HO obliquely, and the axis PS is inclined to it. Hence this poſition is called *oblique*. Principles and Practice.

If the globe is placed in ſuch a poſition that any point of the equator is in the zenith, it is ſaid to be in the poſition of a *right* or *direct ſphere*, becauſe the equator and its parallels are vertical, or over the horizon at right angles. This poſition is ſeen at fig. 7. where the axis PS is in the plane of the horizon, and the equator EQ is in a plane perpendicular to it. The inhabitants of ſuch a ſphere, which are the inhabitants of the earth below the line, have no elevation of the poles, and conſequently no latitude: they can ſee the ſtars at both poles; all the ſtars riſe, culminate, and ſet to them; and the ſun always moves in a curve at right angles to their horizon, and is an equal number of hours above and below it, making the days and nights always equal. 90 Right ſphere.

91 Parallel ſphere. If the globe be ſo placed that one of the poles is in the zenith, and conſequently the other in the nadir, it is in the poſition of a *parallel ſphere*; ſo called becauſe the equator EQ (fig. 8.) coincides with the horizon, and the parallels are of courſe parallel to it; while all the meridians cut the horizon at right angles. The inhabitants of a ſphere, in this poſition, have the greateſt poſſible latitude; the ſtars, which are ſituated in the hemiſphere to which the inhabitants belong, never ſet, but deſcribe circles all around; while thoſe of the contrary hemiſphere never riſe: the ſun is above the horizon for ſix months, during which it is day, and is below the horizon for an equal interval, when it is night.

The wooden horizon is a neceſſary part of the apparatus of both globes; but it has been ſhewn, that in the terreſtrial globe, it can repreſent the rational horizon of a place, only when the globe is rectified for the latitude of that place. In the celeſtial globe, it repreſents the rational horizon in all poſitions.

In Adams's globes there is a thin braſs ſemicircle NHS (fig. 5.) that is moveable about the poles, and has a ſmall thin circle N ſliding on it. This ſemicircle is graduated into two quadrants, the degrees of which are marked both ways from the equator to the poles in the terreſtrial globe: this ſemicircle repreſents a moveable meridian; and the ſmall ſliding circle, which is marked with a few of the points of the compaſs, is called a *viſible horizon*, the uſe of which will appear preſently.

Before we proceed to the remaining problems on the terreſtrial globe, it will be proper to take notice of ſome geographical principles that are connected with the horizon.

It is evident, that the extent of the ſenſible horizon of an obſerver depends on the height of his eye above the level ſurface of the earth. An eye placed on the ſurface of the earth ſees ſcarcely any thing around it; but if it is elevated above that ſurface, it ſees farther in proportion to its elevation, provided always that its view is not obſtructed by intervening objects. Thus, in an extenſive plain, the eye can ſee farther, if elevated to

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called the *prime vertical*) cuts the horizon, are the eaſt and weſt points; the former being on the *left* hand of a perſon facing the ſun at noonday, while the latter is on his *right* hand.

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to a proper height, than it can from the same height in a town or among hills; and, at sea, where the surface is perfectly equal, the view is in proportion to the height of the eye. It becomes an interesting problem to ascertain the extent of the visible horizon, or the distance to which a person can see at any given height of the eye; as, when this is known, we can calculate pretty accurately the distance of an object seen from such a height, as land seen from the topmast of a ship at sea.

For solving this problem, it must be remarked, that the distance of an observer from the boundary of the horizon, or from a distant object, is different when measured along the surface of the earth, and when measured in a direct line. To illustrate this, let HDN (fig. 9.) represent a section of the earth, of which C is the centre, and let D be the situation of an observer, whose eye is elevated to B. The lines BA, BE, tangents to the curve at H and E, represent the limit of the visible horizon, or the radii of the circle circumscribing vision. If the eye were elevated still higher, as to G, it is evident, that the extent of the visible horizon will be increased, being now represented by the tangent GF. The length of the tangent BA, or GF, is easily found by plane trigonometry (E).

93 Horizon of the sea.

It was remarked above, that the visible horizon is most distinct at sea, from the absence of those objects which obstruct vision on land. Hence the sensible horizon is sometimes called the horizon of the sea, and this may be observed by looking through the sights of a quadrant at the most distant part of the sea. In making this observation, the visual rays BA, or GF, by reason of the spherical surface of the sea, always extend a little below the true sensible horizon SS, and consequently below the rational horizon HN, which is parallel to it. Hence the quadrant shews the depression of the horizon of the sea lower than it really is; and it is obvious from the figure, that the higher the eye is situated, the greater must be this depression. Thus, the depression, when the eye is at G, marked by GF, is evidently much greater than that marked by BE, when the eye is at B. The depression of the horizon of the sea is not always the same, though there be no variation in the height of the eye; but the difference in this case is very small, amounting only to a few seconds, and is owing to a difference of the degree of refraction in the atmosphere. Were there no refraction, the visual ray would be BE (when the eye is at B), and E would be the most distant point; but, by reason of the refraction, a point on the surface of the earth beyond E, as F, may be seen by an eye situated no higher than B; and if the refraction were still greater, a still more distant point might be observed.

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94 Difference between the apparent and true levels.

It will be necessary here to anticipate a few remarks respecting the difference between the apparent and true levels; a subject that will be more fully discussed under LEVELLING. Two or more places are on a true level, when they are equally distant from the centre of the earth, and one place is higher than another, or above the true level, when it is farther from the centre of the earth. A line that is equally distant in all its points from the centre, is called the line of true level, and it is evident that this line must be curved: and either make part of the earth's surface, or be concentrical with it. Thus the line DAO, which has all its points, D, A, O, equally distant from the centre C, is the line of true level. But the line of sight DMP, as given by the operation of a level, is a straight line, which is a tangent to the earth's surface at D, always rising higher above the true line of level, according as it extends to a greater distance. This straight line is called the line of apparent level. Thus MA is the height of the apparent level above the true at the distance DA, and OP is the excess of the apparent above the true level, at the distance DO.

The following table was constructed by Cassini, for the purpose of shewing the excess of the apparent above the true level at various distances from the point of observation. It consists of three columns, in the first of which the distance of the observed object from the place of observation is given, from one second to 60 minutes, or a degree. In the second is given the length of the arc measured on a great circle of the earth, that corresponds to the observed distance, in feet and inches; and in the third is given the height of the apparent above the true level in feet and inches, corresponding to each observed and real distance of the object.

(E) In the right-angled triangle ACB (fig. 9.), the length of CB is given, supposing the height of the eye BD to be 6 feet; for adding 6 feet to 19,943,400 feet, the length of the semidiameter of the earth, we have 19,943,406 feet for the length of BC. Then, making the hypothenuse CB radius, we shall have, As radius to the sine of the angle BCA, so is CB to BA; and this will be nearly the same as the arc DA. Again, without finding the quantity of the angle at C, BA may be found, by considering that BA^2 is equal to the difference of the squares of CB and CA, i. e. $BA^2 = CB^2 - CA^2 = (CB+CA) \times (CB-CA) = CB+CA$ into BD; and hence $BA = \sqrt{(CB+CA) \times BD}$.

To illustrate the last in numbers, we have CB = 19,943,406 feet, and CA = 19,943,400 feet. Then, to find BA, we have 19,943,406 + 19,943,400 (= 39,886,806) × 19,943,406 − 19,943,400 (= 6) = 239,320,836; whence $BA = \sqrt{239,320,836} = 15470$ feet nearly, or about three miles.

The distance, to which a person can see, is found to vary as the square root of the altitude of the eye. To find a general expression for this quantity,

let a be the altitude of the eye in feet,
d the distance at that altitude in miles;

then we have $\sqrt{6} : \sqrt{a} = 3 : d = \frac{3}{\sqrt{6}} \times \sqrt{a} = 1.2247 \times \sqrt{a}$. Hence, we deduce this general rule: *Multiply the square root of the height of the eye in feet by* 1.2247, *and the product will be the distance to which we can see from*

Seconds.	Feet.	Inch.	Inch.
1	101	6.8	
2	203	1.6	
3	304	8.4	
4	406	3.2	
5	507	10.0	0.074
6	609	4.8	
7	710	11.6	
8	812	6.4	
9	914	1.2	
10	1015	8.0	0.296
11	1117	2.8	
12	1218	9.6	
13	1320	4.4	
14	1421	11.2	
15	1523	6.0	
16	1625	0.8	
17	1726	7.6	
18	1828	2.4	
19	1929	9.2	
20	2031	4.0	1.186
21	2132	10.8	
22	2234	5.6	
23	2336	0.4	
24	2437	7.2	
25	2539	2.0	
26	2640	8.8	
27	2742	3.6	
28	2843	10.4	
29	2945	5.2	
30	3047	0.0	2.670
31	3148	6.8	
32	3250	1.6	
33	3351	8.4	
34	3453	3.2	
35	3554	10.0	
36	3656	4.8	
37	3757	11.6	
38	3859	6.4	
39	3961	1.2	
40	4062	8.0	4.746
41	4164	2.8	
42	4265	9.6	
43	4367	4.4	
44	4468	11.2	
45	4570	6.0	
46	4672	0.8	
47	4773	7.6	
48	4875	2.4	
49	4976	9.2	
50	5078	4.0	7.409
51	5179	10.8	
52	5281	5.6	
53	5383	0.4	
54	5484	7.2	
55	5586	2.0	
56	5687	8.8	
57	5789	3.6	
58	5890	10.4	
59	5992	5.2	
60	6094	0.0	10.680

Minutes.	Feet.	Feet.	Inch.
1	6094	0	10.680
2	12188	3	6.580
3	18282	7	11.853
4	24376	14	1.812
5	30470	22	1.932
6	36564	31	11.412
7	42658	42	5.436
8	48752	56	9.384
9	54846	71	9.876
10	60940	88	7.728
11	67034	107	2.940
12	73128	127	7.512
13	79222	149	9.444
14	85316	173	8.736
15	91410	199	4.320
16	97504	226	9.264
17	103598	255	11.568
18	109692	286	11.232
19	115786	319	7.188
20	121880	354	0.504
21	127974	390	4.248
22	134068	428	5.352
23	140162	468	10.224
24	146256	510	6.084
25	152350	553	11.232
26	158444	599	1.776
27	164538	646	1.680
28	170632	694	10.944
29	176726	745	5.568
30	182820	797	8.484
31	188914	851	9.828
32	195008	907	8.532
33	201102	965	3.528
34	207196	1024	7.884
35	213290	1085	9.600
36	219384	1148	8.676
37	225478	1213	5.112
38	231572	1277	10.908
39	237666	1348	2.064
40	243760	1417	1.764
41	249854	1496	11.388
42	255948	1569	10.452
43	262042	1638	9.084
44	268136	1716	0.108
45	274230	1794	11.424
46	280324	1875	7.032
47	286418	1958	0.000
48	292512	2042	2.328
49	298606	2128	2.016
50	304700	2215	6.792
51	310794	2305	5.472
52	316888	2396	9.240
53	322982	2489	10.368
54	329076	2584	8.856
55	335170	2681	4.704
56	341264	2779	9.912
57	347358	2880	0.480
58	353452	2982	0.408
59	359546	3085	8.628
60	365640	3191	2.208

from that height in miles. Example. Let the height of the eye be 49 feet. Multiply the square root of 49 or 7, by 1.2247, and we have 8.5729 or about $8\frac{1}{2}$ miles for the distance to which the eye can see at the height of 49 feet. From

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The above table will anſwer ſeveral uſeful purpoſes. In the firſt place, the height of the apparent level above the true may be found by it at any diſtance, from one ſecond to one degree, or $69\frac{2}{10}$ miles. Thus, at the diſtance of 30′=about 35 miles, we have 182820 feet for the length of the arch of a great circle on the earth, and correſponding to this we have 797 feet 8 inches 484 parts for the exceſs of the apparent level above the true. 2. The extent of the viſible horizon correſponding to any height of the eye, may be found from the table by obſervation. The ſemidiameter of the horizon does not ſenſibly differ from an arc of a great circle on the earth, containing as many minutes and ſeconds as are equal to the angle of depreſſion obſerved, and the number of feet contained in ſuch an arc may be found in the table. Thus, if the depreſſion, as obſerved by obſervation, be 40″, its ſemidiameter is alſo about 40″, and the length of the arc correſponding to it is 243,760 feet.

The following table, alſo taken from Caſſini, ſhews the different depreſſions of the horizon of the ſea at different heights of the eye, both by obſervation and calculation; with the difference betwixt the two occaſioned by refraction.

The height of the eye above the ſurface of the ſea.		*The depreſſion of the horizon of the ſea.*	
Feet.	Inches.	′	″
1157	6,9	32	30 by obſervation
		36	18 by calculation
Difference by refraction		3	48
775	2,3	27	0 by obſervation
		29	36 by calculation
Difference by refraction		2	36
571	11,0	24	0 by obſervation
		25	25 by calculation
Difference by refraction		1	25
387	3,4	19	45 by obſervation
		20	54 by calculation
Difference by refraction		1	9
288	4,3	15	0 by obſervation
		17	1 by calculation
Difference by refraction		2	1
187	0,9	13	0 by obſervation
		14	41 by calculation
Difference by refraction		1	41
9	7,3	3	20 by obſervation
		3	18 by calculation
Difference by refraction		0	2

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In the above table, the depreſſion, as eſtimated by calculation, is greater than that by obſervation in every caſe except the laſt, in which the latter is greater by two ſeconds than the former; but this difference was too ſmall to be diſcovered by the inſtrument that Caſſini employed.

Refraction leſſens the angle of depreſſion, by raiſing the objects obſerved; but as this refraction is itſelf variable, the depreſſion and extent of the horizon alſo vary. We are informed by Caſſini, that even in the fineſt weather he obſerved the refraction to differ at the ſame hour of different days, and at different hours of the ſame day. The truth of this obſervation may be eaſily aſcertained by looking through a teleſcope furniſhed with croſs hairs, and fixed in ſuch a poſition that ſome highly elevated object, as the weathercock of a ſteeple, may be ſeen through it; for, on obſerving the weathercock at different times of the day, it will be ſeen ſometimes on the centre of the object-glaſs; ſometimes above, and ſometimes below it. A ſimilar experiment may alſo be made with plane ſights fixed on a croſs-ſtaff. It has long been obſerved, that the top of a diſtant hill may ſometimes, when the refraction is very great, be diſtinctly ſeen from a ſituation from which, at other times, when the refraction is much leſs, it is not diſcernible, even though the ſky be very clear.

Many of the following problems may ſeem to belong to the celeſtial rather than the terreſtrial globe; but as they may be ſolved equally well by means of both, and as perſons not uncommonly poſſeſs a terreſtrial globe without its uſual companion, we ſhall throw as many problems as poſſible under this head.

95 Problems reſpecting the ſun.

PROBLEM IX. *To find the ſun's place in the ecliptic for any given time.*

Find the day of the month in the calendar on the wooden horizon; and oppoſite to it, in the adjoining circle, will be found the ſign and degree in which the

From the above, it is eaſy to deduce the method of computing the diſtance of any object ſeen in the horizon from a certain height. Thus, ſuppoſe a man at the maſt-head, 130 feet above the water, ſees land or a ſhip juſt coming in ſight. We know, that, at this height, an eye can ſee 14 miles, conſequently the object ſeen will be about 14 miles or about five leagues diſtant. If the object is within the horizon, or nearer the place of obſervation, its diſtance may be calculated pretty exactly, by deſcending from the maſt-head till the object juſt comes to the horizon; meaſuring the height at which this takes place, and thence computing the diſtance.

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fun is on the given day. Then look for the fame fign and degree in the circle of the ecliptic drawn on the globe, and that is the fun's place at noon for the given time.

Ex. 1. What is the fun's place on the 4th of June? *Anf.* In 13° 57′ of the fign Gemini.

Ex. 2. Required the fun's place for the firſt day of every calendar month?

For January	♒	11°	23′	July	♋	9°	42′
February	♓	12	35	Auguſt	♌	9	18
March	♈	11	9	September	♍	9	9
April	♉	11	56	October	♎	8	27
May	♊	11	14	November	♏	9	16
June	♋	11	3	December	♐	9	33

PROBLEM X. *To find the fun's declination for any given time.*

Find the fun's place for the given day by Prob. X. and bring it to the brazen meridian. The degree marked on the meridian immediately over the place is the declination required.

Ex. Required the fun's declination for 18th March? The fun's place for the given day is 29° 7′ of ♈, and this being brought to the meridian, will be immediately below 3° 54′ S. which is therefore the declination required.

From the above example, it is evident that the method of finding the declination of the fun correſponds to that of finding the latitude of a place on the globe, given in Problem I. the fun's declination being meaſured in the ſame way by an arc of the meridian interpoſed between the equator and the fun's place in the ecliptic (F).

PROBLEM XI. *To rectify the globe for the fun's place and the day of the month.*

Find the fun's declination for the given day, by Problem XI.; then elevate the pole that is in the ſame hemiſphere with the degree of declination, as many degrees as are equal to the declination.

Ex. Rectify the globe for the fun's place on the 6th of October? *Anf.* The fun's declination on that day is 5° S. therefore the ſouth pole muſt be elevated 5° above the horizon.

Rectifying the globe for the fun's declination correſponds to the rectifying of it for the latitude of a given place. See N° 88.

PROBLEM XII. *To find the time of the fun's riſing and ſetting at a given place, for any given day.*

Rectify the globe for the declination on the given day, and bring the given place to the meridian, and ſet the index of the hour circle at XII. Turn the globe, till the given place come to the eaſtern edge of the horizon, and the time of ſunriſe will be ſhewn by the poſition of the index. Then turn the globe till the given place come to the weſtern part of the horizon, and the poſition of the index will point out the time of ſunſet.

To perform the ſame problem by Adams's globes. Principles and Practice.

Rectify the globe for the declination, bring the given place to the meridian, and ſet the horary index at 12 as before; then turn the globe towards the weſt, till the given place reach the weſtern edge of the horizon, and the index will point to the time of ſunriſe. The time of ſunſet will be known, in like manner, by bringing the place to the eaſtern ſide of the horizon.

If the hour circle in the ordinary globes has a double row of figures, the fun's riſing and ſetting may be found at the ſame time; for if the place be brought to the eaſtern part of the horizon, the time of ſunriſe will be ſhewn by the index, in that circle where the hours increaſe towards the eaſt; and the time cut by the index in the circle where the hours increaſe towards the weſt, will ſhow the time of ſunſet.

Ex. 1. Required the time of the fun's riſing and ſetting at London, on the 29th Auguſt? *Anf.* The ſun riſes at nine minutes after five, and ſets nine minutes before ſeven.

Ex. 2. Required the time of ſunriſe and ſunſet at Edinburgh on the 1ſt of June? *Anf.* For ſunriſe, 27 minutes after three; for ſunſet, 33 minutes after eight.

COROLLARY. From this problem we may eaſily find the length of the day and night for any given time; for, having found by the globe the time of ſunriſe and ſunſet, the double of the latter is the length of the day, and the double of the former the length of the night.

PROBLEM XIII. *To find the ſun's meridian altitude on any given day, at a given place.*

Rectify the globe for the latitude of the given place, by Problem VIII.; find the ſun's place on the given day by Problem IX and bring it to the brazen meridian. Then fix the quadrant of altitude in the zenith, or over the given place, and bring it over the ſun's place; and the degree of the quadrant lying over the ſun's place will ſhew the meridian altitude.

If the globe has no quadrant of altitude, the ſun's meridian altitude may be found by counting the number of degrees on the meridian, between the horizon and the ſun's place.

Ex. Required the ſun's meridian altitude at Edinburgh on the 21ſt of June? *Anf.* 57° 30′, or the greateſt poſſible, this being the ſummer ſolſtice.

COROLLARY. It may be known whether the ſun's meridian altitude be north or ſouth, by the following obſervations. When the ſun's declination and the latitude of the place are of different names, i. e. the one north and the other ſouth, the meridian altitude is of the ſame name with the declination. If the declination and latitude be both north or both ſouth, the altitude is of the ſame name with the declination, if the latter be the greater; but, otherwiſe, the altitude is of an oppoſite name.

PROBLEM XIV. *Having the latitude of the place and the day of the month given, to find the ſun's altitude for any given hour.*

Rectify the globe for the latitude; find the ſun's place, and bring it to the meridian, and ſet the horary index

(F) For a table of the ſun's declination correſponding to his true place, ſee Vol. III. p. 170.

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index to noon; turn the globe till the index point to the given hour, then fix the quadrant of altitude in the zenith, and bring its graduated edge over the sun's place, and the degree cut by the sun's place will be the altitude required.

Ex. What will be the sun's altitude at 10 o'clock A. M. on the 30th of November at Edinburgh? *Anſ.* 8° 50′.

PROBLEM XV. *Having the ſun's meridian altitude given at any place, to find the latitude of the place.*

Bring the ſun's place for the given day to the meridian, and move the globe in the horizon till the diſtance between the ſun's place and the northern or ſouthern edge of the horizon, (according as the caſe may require), be equal to the given altitude. The degree of elevation of the pole will ſhew the latitude required.

Ex. The ſun's meridian altitude obſerved at a certain place on 5th Auguſt is 74° 24′ N. What is the latitude of the place? *Anſ.* 1° 36′ N.

PROBLEM XVI. *The latitude of the place and the day of the month being given, to find when the ſun is due eaſt or due weſt.*

Rectify the globe for the latitude of the place, bring the ſun's place to the meridian, and ſet the index to XII. Fix the quadrant of altitude in the zenith, and if the ſun's declination be of the ſame name with the latitude, bring the graduated edge of the quadrant to the eaſtern ſide of the horizon; but if the declination is of a different name from the latitude, bring the quadrant to the weſtern part of the horizon. Turn the globe till the ſun's place in the ecliptic come below the edge of the quadrant, and the index will point to the hour when the ſun is due eaſt. Subtract this from XII. and the remainder ſhews the time when the ſun is due weſt.

Ex. At what hours is the ſun due eaſt and weſt at the ſummer and winter ſolſtice at Greenwich? *Anſ.* At the ſummer ſolſtice he is due eaſt at 20 minutes paſt ſeven, and due weſt at 20 minutes before five. At the winter ſolſtice he is due eaſt at 20 minutes before five, and due weſt at 20 minutes paſt ſeven.

COROLLARY. When the declination and latitude are of the ſame name, the ſun is due eaſt after riſing; but when the declination and latitude are of different names, he is due eaſt before riſing. As it is not convenient to obſerve on the globe when the ſun is due eaſt before riſing, or while he is under the horizon, it is better to bring the oppoſite point of the ecliptic due weſt, and then the index ſhews the time when he is due eaſt.

PROBLEM XVII. *Having a place in the torrid zone given, to find on what two days of the year the ſun is vertical at that place.*

Find the latitude of the given place, and keeping that in view, turn the globe round, noting the two points at the ecliptic that paſs below the degree of latitude. Find in the calendar circle of the horizon the days correſponding to thoſe points of the ecliptic; and theſe are the days on which the ſun is vertical at the given place.

Ex. 1. On what days is the ſun vertical at St Helena, in latitude 15° 55′ S.? *Anſ.* On 6th February and 6th November.

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Ex. 2. Required the days on which the ſun is vertical at Tobago, in latitude 11° 29′ N.? *Anſ.* On April 19. and Auguſt 23.

PROBLEM XVIII. *To find thoſe places in the torrid zone where the ſun is vertical on a given day.*

Find the ſun's place for the given day, and bring it to the brazen meridian; then turn the globe, and note all the places which paſs under that point of the meridian: theſe will be the places to which the ſun is vertical on the given day.

Ex. 1. In what places is the ſun vertical at the ſummer ſolſtice? *Anſ.* At Canton in China, at Calcutta in Bengal, at Mecca in Arabia, and at the Havannah.

Ex. 2. To what places is the ſun vertical on the 16th of May and 29th of July? *Anſ.* At Bombay, Pegu, in the northern part of Manilla, in the middle of the Ladrone iſlands, at Owhyhee, Mexico, in Hiſpaniola, and at Tombuctoo in the central parts of Africa.

PROBLEM XIX. *Having the day and hour at any given place, to find where the ſun is then vertical.*

Find the ſun's declination by Problem XI. and the places where it is noon at the given time, by Problem III.; then any of thoſe places where it is noon, whoſe latitude is the ſame as the ſun's declination, will have the ſun vertical at the given time.

Ex. On the 1ſt of Auguſt at Edinburgh, it being 35 minutes paſt four, P. M. it is required to find where the ſun is vertical? *Anſ.* The ſun's declination on that day is 18° 14′ N. and the place where it is noon at the given time, that lies neareſt in latitude to the declination, is Kingſton in Jamaica: this, therefore, is the place required.

PROBLEM XX. *A place in the northern frigid zone being given, to find when the ſun begins to appear above the horizon, and when to diſappear; as alſo the length of the longeſt day and night.*

Rectify the globe for the latitude, and bring the *aſcending* ſigns of the zodiac (ſee ASTRONOMY, N° 52.) to the ſouthern part of the horizon; obſerve what degree of the ecliptic is interſected by that point of the horizon, and in the calendar circle find the day of the month anſwering to that degree. That will ſhew the time of the ſun's firſt appearance above the horizon at the given place, and this is the end of the longeſt night in that latitude. Then bring the *deſcending* ſigns to the ſame part of the horizon, and obſerve the day which anſwers to the degree of the ecliptic interſected; this will ſhew the time of the ſun's diſappearance, or the beginning of the longeſt night. Now bring the aſcending ſigns to the northern part of the horizon, and obſerve the degree of the ecliptic, and the correſponding day as before, which will give the time when the ſun begins to ſhine continually, or the beginning of the longeſt day. Again, bring the deſcending ſigns to the ſame point, and thus will be given the time when the ſun ceaſes to ſhine continually, or the end of the longeſt day.

Ex. At what time does the ſun begin to appear above

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above the horizon at North Cape in Lapland, the latitude of which is 72° N.? When does he disappear, and how long is he entirely absent during the longest night? *Ans.* He begins to appear on the 26th of January, and entirely disappears on the 16th of November; he is therefore absent for 71 days.

Cor. From the sun's first appearance at the end of the longest night to the beginning of the longest day, and from the end of the longest day to the sun's total disappearance at the beginning of the longest night, he rises and sets every day.

Problem XXI. *To find in what part of the northern frigid zone the sun begins to shine continually on a given day.*

Find the sun's declination for the given day, and subtract this from 90°, the remainder will shew the latitude required.

Note.—The given day must be between the 21st of March and the 21st of June, as at no other time does the sun begin to shine continually in the northern frigid zone.

Ex. Required the latitude in which the sun begins to shine without setting on the 1st of June? *Ans.* The sun's declination for that day is 22° N. and this subtracted from 90° leaves 68° N. the latitude required.

96 Problems respecting the climates.

Problem XXII. *The length of the longest day in any place being given, to find the latitude of that place.*

Bring the 1st degree of Cancer to the meridian, and set the horary index at noon. Then turn the globe towards the west, till the index point to the hour of sunset, or half of the length of the given day; raise or depress the pole, till the sun's place in the ecliptic is exactly in the western edge of the horzion. The elevation thus obtained will be equal to the required latitude.

In Adams's globes, after bringing the first degree of Cancer to the meridian, and setting the index to noon, the globe must be turned towards the west, till the index shew the time of sunset, and the sun's place must be brought to the eastern side of the horizon.

Ex. In what latitude is the longest day 18 hours long? *Ans.* In latitude 58° 30′ N.

By this problem the limits of the hour climates may be pretty nearly ascertained.

Problem XXIII. *To find the latitudes of those places in the frigid zone where the sun is continually above the horizon for a given number of days.*

Count from the first degree of Cancer towards the nearest equinoctial point, as many degrees as is equal to half the given number of days; bring the point thus obtained below the meridian, and note the degree of the meridian which it intersects. This subtracted from 90° will leave a remainder that is nearly equal to the latitude of the place.

Ex. In what latitude does the sun never set during 76 days? *Ans.* In latitude 71° 30′, or very near the southern part of Nova Zembla.

Note.—This problem cannot be performed accurately by the globe; for as the sun requires 365 days six hours to move through the whole 360° of the ecliptic, he does not advance quite a degree in 24 hours.

By this problem the limits of the month climates may be pretty nearly ascertained. Principles and Practice.

Problem XXIV. *The hour and day being given at any place, to find in what places the sun is rising, and in what he is setting; where it is noon, and where midnight.*

Find by Problem XIX. the place to which the sun is vertical at the given time; rectify the globe for the latitude of that place, and bring the place below the meridian. In this position of the globe all those places that lie within the western edge of the horizon will have the sun rising, and all those which are in the eastern edge of the horizon will have it setting. Again, to those places which lie under the upper semicircle of the brazen meridian, it will be noon; and to those which lie below the lower semicircle, it will be midnight.

Ex. Suppose it be four o'clock P. M. on the 4th of June at London; where is the sun at that time rising, and where is he setting; to what places is it noon, and to what midnight? *Ans.* The north-eastern part of Siberia, Kamtschatka, the most western of the Sandwich isles, and the most eastern of the Society isles, are within the western edge of the horizon, and consequently to these the sun is rising. At Tobolsk, in the Caspian sea, in the desert of Arabia, in the middle of the Red sea, in Abyssinia, in the central parts of Africa, and in the country of the Hottentots, the sun will be setting, as these places lie within the eastern edge of the horizon. New Britain, the islands of Martinique and Trinidad, and the middle part of South America, which lie below the upper semicircle of the meridian, have noon; and Chinese Tartary, the eastern part of China, the Philippine isles, and the western part of New Holland, which are situated below the under edge of the semicircle, have midnight.

97 On twilight.

As the remaining problems on the terrestrial globe chiefly respect the continuance of twilight, it is proper, before we proceed, to make a few remarks on this subject. For the explanation of the term, see Crepusculum and Twilight.

The *Crepusculum*, or *Twilight*, it is supposed, usually begins and ends when the sun is about 18° below the horizon; for then the stars of the 6th magnitude disappear in the morning, and appear in the evening. It is of longer duration in the solstices than in the equinoxes, and longer in an oblique sphere than in a right one; because in those cases the sun, by the obliquity of his path, is longer in ascending through 18° of latitude.

Twilight is occasioned by the sun's rays refracted in our atmosphere, and reflected from the particles of it to the eye. For let A (fig. 10) be the place of an observer on the earth ADL, AB the sensible horizon, meeting in B the circle CBM bounding that part of the atmosphere which is capable of refracting and reflecting light to the eye. It is plain that when the sun is under the horizon, no direct rays can come to the eye at A: but the sun being in the refracted line CG, the particle C will be illuminated by the direct rays of the sun; and that particle may reflect those rays to A, where they enter the eye of the spectator. And thus the sun's light illuminating an innumerable multitude of particles, may be all reflected to the spectator at A.

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A. From B draw BD touching the circle ADL in D, and let the ſun be at S in the line AD; then the ray SB will be reflected into the ſituation BA, and will enter the eye, becauſe from a principle in optics the angle of incidence DRC is equal to the angle of reflection ABE. See OPTICS. This ray SB, or BA, will therefore be the firſt that reaches the eye at dawn in the morning, and the laſt that falls on the eye at night, when twilight ceaſes, becauſe as the ſun gets lower down, the particles of the air at B will no longer be illuminated.

The depth of the ſun below the horizon at the beginning of the morning or end of the evening twilight, is determined by obſerving the moment when the air firſt begins to ſhine in the morning, or ceaſes to ſhine in the evening; then finding the ſun's place for that time, and hence the time till his riſing in the horizon, or after his diſappearance below. This depth of the ſun below the horizon has been variouſly ſtated by different aſtronomers, but it is now generally eſtimated at 18°. Accordingly in Mr Adams's globes there is a circular wire fixed 18° below the horizon, to repreſent the limits of the crepuſculum (ſee PWY, fig. 5.).

As the cauſe of twilight is not conſtant, its limits muſt continually vary; for if the exhalations in the atmoſphere be more copious or more extenſive than uſual, the morning twilight will begin ſooner, and that of the evening laſt longer than ordinary; as the more copious the exhalations, the more rays will be reflected from them, and conſequently the more they will ſhine, and again, the higher they are, the ſooner they will be illuminated by the ſun. From this circumſtance the evening twilight is commonly longer than the morning, at the ſame time, and in the ſame place. The refraction is alſo greater according as the air is more denſe, and not only is the brightneſs of the atmoſphere variable, but the ſame takes place in its height above the earth; therefore, the twilight is longeſt in hot weather, and in hot countries, all other things being equal. The chief differences, however, ariſe from the different ſituations of places on the earth, or from the difference of the ſun's place in the heavens. Thus, the twilight is longeſt when the earth is in the poſition of a parallel ſphere, and ſhorteſt in that of a right ſphere (ſee N° 90.): and in an oblique ſphere, the twilight continues longer at any place, in proportion as that place is nearer to either of the poles; a circumſtance which affords conſiderable relief to the inhabitants of the northern countries in their long winter nights. Twilight continues longeſt in all places of north latitude, when the ſun is in the tropic of Cancer, and to thoſe in ſouth latitude when he is in the tropic of Capricorn. The time of the ſhorteſt twilight alſo varies in different latitudes; thus, in England, the ſhorteſt twilight is about the beginning of October and of March, when the ſun is in ♎ and ♓; hence, when the difference between the ſun's declination and the depth of the equator is leſs than 18°, ſo that the ſun does not deſcend more than 18° below the horizon, the twilight will continue through the whole night, as happens in Britain from the 22d of May to the 22d of July.

In the latitude of 49° N. twilight continues for the whole night, only on the 21ſt of June, or the time of the ſummer ſolſtice: but at all places further to the north it continues for a certain number of days before and after the ſummer ſolſtice.

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Near the north pole there is continual twilight from the 22d of September, the time of the ſun's permanent abſence, to the 12th of November. It then ceaſes till about the 30th of January, when it again appears, and continues till the 21ſt of March, the time of the ſun's permanent appearance. Hence the inhabitants of thoſe places neareſt the pole, though they never ſee the ſun for nearly ſix months, have, however, the benefit of twilight for above the half of that time, and are entirely excluded from the ſun's light little more than 12 weeks, during ſix of which the moon is conſtantly above the horizon.

98 Uſes of twilight.

Were it not for the gradual change from light to darkneſs, and *vice verſa*, which is the conſequence of twilight, much inconvenience would ariſe. A ſudden change from the darkneſs of midnight to the full ſplendour of the ſun, and the reverſe, would injure the ſight, and would, in many caſes, be productive of much danger to travellers, who would be overtaken by utter darkneſs before they had time to prepare for its approach.

99 Problems reſpecting twilight.

PROBLEM XXV. *To find where it is twilight at any given time.*

Find where the ſun is vertical at the given time, and rectify the globe for the latitude of that place. Obſerve what places are within the limits of twilight, or not quite 18° below the horizon. To thoſe which are ſituated within the weſtern zone, between the horizon and the parallel of 18°, it will be twilight in the morning; and thoſe which are in the eaſtern zone will have it twilight in the evening.

This problem may be more conveniently performed by rectifying the globe for the antipodes of the place which has the ſun then vertical, and obſerving what places are ſituated in the zone formed above the horizon, between it and a parallel circle of 18°.

Ex. It is required to find where it is twilight on the 4th of June, when it is three o'clock P. M. at London.. *Anſ.* Kamtſchatka, the Sandwich iſles, and the Marqueſas, have twilight in the morning; and the inhabitants of Madagaſcar, of Tibet, and the eaſtern part of Perſia, have twilight in the evening.

PROBLEM XXVI. *To find the duration of twilight at a given place on any given day.*

Rectify the globe for the latitude of the place; find the ſun's place for the given day by Problem X. and bring it below the meridian, and ſet the horary index to XII. Turn the globe till the ſun's place be juſt within the circle that marks the limit of twilight, and the index will ſhew the beginning of twilight. Subtract the time of the beginning of twilight from the time of ſunriſing at the given place (found by Problem XII.) and the remainder will ſhew the duration of twilight at the given place.

Note.—The above rule will anſwer both for the ordinary globes, and for thoſe of Adams, except that in the latter the ſun's place muſt be brought below the weſtern part of the horizon. A more convenient way in both globes will be, to bring that point of the ecliptic which is oppoſite to the ſun's place, 18° above the

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the weſtern horizon, and the index will then ſhew the beginning of twilight.

Ex. How long will twilight continue at London on the following days: March 2d; September 25th; and December 26th? *Anſ.* On the 2d of March it will continue one hour and fifty minutes; on the 25th of September two hours; and on the 26th of December, two hours ten minutes (G).

100 Cauſe of day and night.

PROBLEM XXVII. *To ſhew the cauſe of day and night by the globe.*

It will have appeared, from the conſideration of the cauſe of day and night given under the article ASTRONOMY, that only that half of the earth which is oppoſite to the ſun, is illuminated by his rays, while that which is turned from him is involved in darkneſs. As the earth revolves on its axis from weſt to eaſt, in the ſpace of 24 hours, every place on the earth in the courſe of that time alternately enjoys the light of the ſun, and is deprived of it.

To illuſtrate this by the globe, rectify the globe for the ſun's declination, ſo as to place the ſun in the zenith, and the horizon will repreſent the boundary between light and darkneſs; that hemiſphere which is above the horizon being illuminated by the ſun's rays, and that which is below the horizon being deprived of light. If now a patch is put on the globe, ſo as to repreſent any place, and if the globe be made to revolve from weſt to eaſt; when the place is brought to the weſtern edge of the horizon, the ſun will appear to the inhabitants of that place to be riſing in the eaſt, though, in fact, the appearance ariſes from the place itſelf coming beyond the limit of darkneſs. As the globe continues to turn, the place riſes towards the meridian, and this produces the appearance as if the ſun were advancing towards the meridian in a contrary direction. When the place comes below the meridian, it is noon to that place, and the ſun appears to have attained its greateſt height.

As the place proceeds towards the eaſt, it gradually recedes from the meridian, and the ſun appears deſcending in the weſt. When it reaches the eaſtern edge of the horizon, and is proceeding below the boundary of light and darkneſs, the ſun appears to be ſetting; and during the whole time that the place is moving below the horizon, the ſun will not appear till the place once more riſes in the weſt.

101 Problem on lunar eclipſes.

PROBLEM XXVIII. *To find at what places an eclipſe of the moon is viſible at any given time.*

Find the place to which the ſun is vertical at the given time, and rectify the globe for the latitude of that place. As the moon is oppoſite to the ſun, which illuminates the ſuperior hemiſphere of the globe, the eclipſe of the moon will be viſible to all the places that lie below the horizon.

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As the places below the horizon are not eaſily examined, this problem may be more conveniently performed by rectifying the globe for the antipodes of the place to which the ſun is vertical at the given time, rather than for the place itſelf; as in this latter poſition of the globe the moon being in oppoſition to the ſun, will be vertical to the place below the zenith, and its eclipſe will be viſible at all the places now above the horizon.

Ex. 1. On the 4th of January 1806, at 55 minutes paſt 11 P. M. reckoning the time at Greenwich, there was an eclipſe of the moon. It is required to find thoſe places to which the eclipſe was viſible? *Anſ.* Through the greateſt part of Africa, in ſome part of Europe, in Aſia, South America, and a great part of North America.

Ex. 2. On the 10th of May 1808, when it is eight o'clock A. M. at Greenwich, the moon will be totally eclipſed. In what places will the eclipſe be viſible? *Anſ.* In moſt parts of America; in the iſlands of the Pacific ocean, and on the eaſtern coaſt of New Holland.

SECT. II. *Of the Uſe of the Celeſtial Globe.*

102 Celeſtial globe.

The celeſtial globe, with reſpect to the circles that are deſcribed on it, and the apparatus with which it is furniſhed, ſcarcely differs from the terreſtrial globe, which has been ſo fully deſcribed in the preceding ſection. The ſurface of the celeſtial globe is made to repreſent all the ſtars that are commonly viſible to the naked eye, arranged under their conſtellations, and bounded by the figures which have been given to theſe conſtellations by the early aſtronomers. (See fig. 5.). In Adams's celeſtial globe the moveable ſemicircle (N° 91.) turning round the poles repreſents a circle of declination, and the ſmall circle on it, an artificial ſun or planet.

Both the globes are often furniſhed with a mariner's compaſs, which is uſually placed in the lower part of the frame.

It muſt here be remarked, that the repreſentation of the heavens on the celeſtial globe, though probably much more accurate than that of the earth on the terreſtrial, is not ſo natural as the latter; for, in viewing the ſtars on the external ſurface of a globe, the ſpectator ſees them in an oppoſite poſition to that in which he obſerves them in the heavens, ſo that to form a juſt conception of their exact ſituation, he muſt ſuppoſe his eye to be ſeated in the centre of the globe. Hence, if a large hollow hemiſphere were made of glaſs, and if the ſtars in the correſponding hemiſphere of the firmament were painted in tranſparent colours on its ſurface; an eye ſituated in the centre of ſuch a hemiſphere

(G) If we have the latitude of a place, and the ſun's declination given, we may find the beginning of the morning and the end of the evening twilight by calculation. Thus, in the oblique-angled ſpherical triangle ZPN (fig. 11.) we have given ZP the co-latitude; PN the co-declination, and ZN=108° being the ſum of 90° the quadrant, and 18° the depreſſion at the extremity of twilight. Then by ſpherical trigonometry we may calculate the triangle ZPN, the hour angle from noon, and this reduced to time, at the rate of 15° per hour, gives the time from noon to the beginning or end of twilight. For the mode of calculation, ſee SPHERICS.

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ſphere would ſee the ſtars exactly as they appear in the heavens.

The great uſe of the celeſtial globe is to perform a varicty of problems with reſpect to the ſtars, and the motions of the heavenly bodies through the ſpace which they occupy.

PROBLEM I. *To place the celeſtial globe in ſuch a ſituation as that it ſhall exhibit an accurate repreſentation of the face of the heavens at any given place, and at any given time.*

Rectify the globe for the latitude of the place, as in Problem VIII. of the terreſtrial globe, or by ſetting the pole of the celeſtial globe pointing to the pole of the earth, by means of the compaſs that is uſually annexed to the globes; find the ſun's place in the ecliptic; bring this to the meridian, and ſet the horary index at noon. Again, make the globe turn on its axis till the index point to the given time, and in this poſition the globe will exactly repreſent the face of the heavens, correſponding to the given time and place; every conſtellation and ſtar in the heavens anſwering in poſition to thoſe on the globe. Hence, by examining the globe, it will immediately be ſeen what ſtars are above or below the horizon, which are on the eaſtern and weſtern parts of the heavens, which have juſt riſen above the horizon, and which are about to ſink below it.

As this problem will be found extremely uſeful to the ſtudent of aſtronomy, we ſhall here quote the example given in illuſtration of it by Meſſrs Bruce of Newcaſtle.

"Required the ſituation of the ſtars for the latitude of Newcaſtle, on October 6th, at eight o'clock in the evening?

"In our preſent ſurvey of the heavens, we ſhall commence at the north point of the horizon, and proceed round eaſtward; noticing the different conſtellations, and the relative ſituation of the principal ſtars in theſe conſtellations.

"The firſt ſtar which ſtrikes the eye of the obſerver, in the north-eaſt part of the heavens, is Capella, in the conſtellation Auriga, or the Waggoner: It is of the firſt magnitude, of the altitude of 23°, or nearly the fourth part of the diſtance from the horizon to the zenith. There are two ſtars of the ſecond magnitude, which form with Capella a triangle:—The ſtar which forms the ſhort ſide of the triangle is in the right ſhoulder of Auriga, and is marked β; it lies at the diſtance of about 8° from Capella, further to the north; its altitude is 18°:—The ſtar forming the longer ſide of the triangle is in the Bull's northern horn; its diſtance from Capella is more than 26°; its altitude not more than 5°, and azimuth N. E. There are three ſtars of the fourth magnitude, a little to the ſouth of Capella, that bear the name of the *Kids*.

"If a line be drawn through the two ſtars that form the upper ſide of the triangle, and continued to the horizon, it will point out Caſtor, α, in Gemini juſt riſing, azimuth E. N. E: it is between the firſt and ſecond magnitude. The other ſtars in this conſtellation have not yet riſen.

"A line drawn between Caſtor and Capella, and continued higher in the heavens, will point out Perſeus, in which there are three ſtars, one of the ſecond magnitude, α, named *Algenib*, and two of the third magnitude, one on each ſide of Algenib, at the diſtance of about 5°: they form a line a little curved on the ſide next Auriga. The altitude of Algenib is 37°; azimuth N. E. by E.

"A little to the ſouth of Perſeus is the Head of Meduſa, which Perſeus is holding in his hand. Beſides two or three ſmall ſtars, it contains one of the ſecond, and one of the third magnitude. The name of the brighteſt is *Algol*; altitude 33°, azimuth E. N. E Algol is only 10° diſtant from Algenib.

"Directly below the Head of Meduſa, about 14° above the horizon, are the Pleiades or ſeven ſtars: They are ſeated in the ſhoulder of Taurus, and are ſo eaſily known, that no deſcription is neceſſary. Aldebaran, a ſtar of the firſt magnitude, which forms the eye of Taurus, is juſt riſing; azimuth E. N. E. A vertical circle drawn through Algol will point to it. There are two ſtars of the third magnitude, and ſeveral ſmaller very near Aldebaran, which form with it a triangle. The whole cluſter is called the *Hyades*.

"A line drawn from Aldebaran through Algol, and continued to the zenith, will direct to Caſſiopeia. This contains five ſtars of the third magnitude, beſides ſeveral of the fourth: it is in form ſomething like the letter Y, or, as ſome think, an inverted chair. It is ſituated above Perſeus, within 30° of the zenith. The altitude of the brighteſt ſtar, α, called *Schedar*, is 60°; azimuth, E. N. E,

"Below Caſſiopeia and weſt of Perſeus is Andromeda, which contains three ſtars of the ſecond magnitude. A line from Algenib, parallel to the horizon towards the ſouth, will paſs very near theſe three ſtars; and, as they are all of the ſame magnitude, and placed nearly at the ſame diſtance of 15° from each other, they may eaſily be known. The name of the ſtar neareſt Perſeus, and which is in the foot of Andromeda, marked γ, is Almaak: its altitude is 49°; azimuth E. N. E. The name of β, in the girdle, is Mirach: its altitude 44°; azimuth E. The altitude of α, in the head of Andromeda, is 46°; azimuth E. S. E.

"About 18° below Mirach are two ſtars in Aries, not more than 5° diſtant from each other, forming with Mirach an iſoſceles triangle: the moſt eaſtern ſtar, α, is of the ſecond magnitude; the other, β, of the third, attended by a ſmaller ſtar, marked γ, of the fourth magnitude. A line drawn from Mirach, perpendicular to the horizon, will paſs between the two, and beſides, will point to a ſtar of the ſecond magnitude, directly E. not above 3° from the horizon.

"This ſtar is the firſt of Cetus, marked α, and is of the ſecond magnitude: it is named *Menkar*. A line drawn from Capella through the Pleiades will alſo point to it. Cetus is a large conſtellation, and contains eight ſtars of the third magnitude; they all lie to the weſt of Menkar; β, a ſtar in the tail, is more than 40° diſtant from it. The azimuth of β is S. E. by E; altitude nearly the ſame as Menkar.

"The conſtellation Piſces is ſituated next to Aries; it contains one ſtar of the third magnitude, marked α: its altitude is 10°, azimuth E. by S. It is diſtant from Menkar 15°. A line drawn from Almaak, through α in Aries, will point to it.

"If we return again to α. in the head of Andromeda, we ſhall find threeother ſtars nearer the meridian, which, with

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with it, form a ſquare. Theſe ſtars are in Pegaſus, and are placed at the diſtance of 15° from each other; they are all of the ſecond magnitude. The two ſtars forming the weſtern ſide of the ſquare are called—the upper one Scheat, which is marked β, and which is in the thigh of Pegaſus; the under one Markab, which is marked α, and which is in the wing; the loweſt ſtar in the eaſtern ſide of the ſquare is in the tip of the wing, and is marked γ. The altitude of Scheat is 55°; azimuth S. E. $\frac{1}{2}$ E. Altitude of Markab, 43°; azimuth S. E. by S $\frac{1}{2}$ E.

"A line drawn through γ and β (the diagonal in the ſquare of Pegaſus) and continued to the meridian, will point out Cygnus, a remarkable conſtellation in the form of a large croſs, in which there is a ſtar of the ſecond magnitude, named *Deneb*, or *Arided*; it is marked α, and is almoſt directly upon the meridian at the altitude of 80°. Cygnus contains ſix ſtars of the third magnitude. The conſtellation Cepheus, which contains no remarkable ſtars, is ſituated between Cygnus and the north pole.

"Below Pegaſus, and nearer the meridian, is Aquarius, containing four ſtars of the third magnitude. A line drawn from α in Andromeda, through Markab, will point to α in Aquarius. Its altitude is 32°; azimuth S. S. E.

"A bright ſtar of the firſt magnitude named *Fomelhaut*, in Piſces Auſtralis, is then upon the horizon; azimuth S. S. E.

"Delphinus is a ſmall conſtellation, ſituated about 30° below Cygnus upon the meridian; it contains five ſtars of the third magnitude, four of them being placed cloſe together, and forming the figure of a rhombus or lozenge. A line drawn through the two under ſtars of the ſquare will point to it. Its altitude is about 50°.

"A little to the weſt of Delphinus, but not quite ſo high, is Aquila, containing one very bright ſtar of the firſt magnitude, named *Atair:* It may very eaſily be known from having a ſtar on each ſide of it of the third magnitude, forming a ſtraight line. The length of the line is only about 5°; altitude of Atair 40°; azimuth S. S. W.

"Conſiderably above Atair, and a little to the W. of Cygnus, is Lyra, containing a ſtar of the firſt magnitude, one of the moſt brilliant in the firmament. It is called Lyra or Vega, and is 35° to the N. W. of Atair; altitude 60°; azimuth W. S. W. Lyra, Atair, and Arided, form a large triangle.

"We come now to notice three conſtellations, which occupy a large ſpace in the weſtern ſide of the heavens: theſe are Hercules immediately below Lyra; Serpentarius between Hercules and the horizon, extending a little more towards the ſouth; and Boötes, reaching from the horizon W. N. W. to the altitude of 45°.

"Hercules contains eight ſtars of the third magnitude; the ſtar in the head, α, named Ras Algethi, is within 5° of α in the head of Serpentarius. This laſt is a ſtar of the ſecond magnitude, and is named Ras Alhague: its altitude is 30°; azimuth, S. W. by W. $\frac{1}{2}$ W. A line drawn from Lyra, perpendicular to the horizon, will paſs between theſe two ſtars. The other ſtars in Hercules extend towards the zenith, and thoſe in Serpentarius towards the horizon.

"The conſtellation Boötes may eaſily be known from the brilliancy of Arcturus, a ſtar of the firſt magnitude, and ſuppoſed to be the neareſt to our ſyſtem of any in the northern hemiſphere: it is within 10° of the horizon; azimuth W. N. W. Boötes alſo contains ſeven ſtars of the third magnitude, moſtly ſituated higher in the heavens than Arcturus. The ſtar immediately above Arcturus is called Mezen Mirach, and is marked ε. The ſtar in the left ſhoulder, δ, named Seginus, forms with Mirach and Arcturus a ſtraight line.

"Between Serpentarius and Boötes is *Serpens*, containing one ſtar of the ſecond magnitude, and eight of the third: α in *Serpens* is nearly at the ſame diſtance from the horizon, as Arcturus; azimuth W.

"Above Serpens, and a little to the eaſt of Boötes, is the Northern Crown, containing one ſtar of the ſecond magnitude, named Gemma, and ſeveral of the third, which have the appearance of a ſemicircle. A line drawn from Lyra to Arcturus will paſs through this conſtellation.

"We come now to Urſa Major, a conſtellation containing one ſtar of the firſt, three of the ſecond, and ſeven of the third magnitude. It may eaſily be diſtinguiſhed by thoſe ſeven ſtars, which, from their reſemblance to a waggon, are called Charles's Wain. The four ſtars in the form of a long ſquare, are the four wheels of the waggon; the three ſtars in the tail of the Bear, are the three horſes, which appear fixed to one of the wheels. The two hind wheels, α named Dubhe, and β, are called the pointers, from their always pointing nearly to the north pole. Hence the pole ſtar may be known. The altitude of Dubhe is 30°; azimuth N. by W. $\frac{1}{2}$ W. The diſtance between the two pointers is 5°; the diſtance between the pole ſtar and Dubhe, the upper pointer, is 30°.

"Urſa Minor, beſides the pole ſtar of the ſecond magnitude, ſituated in the tail, contains three of the third, and three of the fourth magnitude. Theſe form ſome reſemblance to the figure of Charles's Wain inverted, and may eaſily be traced.

"Draco, containing four ſtars of the ſecond and ſeven of the third magnitude, ſpreads itſelf in the heavens near Urſa Minor: the four ſtars in the head are in the form of a rhombus or lozenge: the tail is between the pole ſtar and Charles's Wain.

"Beſides theſe conſtellations, there are a number of others, which, as they contain no remarkable ſtars, we have not deſcribed; an enumeration of theſe will ſuffice. The Lynx, between Urſa Major and Auriga; Camelopardalus, between Urſa Major and Caſſiopeia; Muſca, and the Greater and Leſs Triangles between Aries and Perſeus, Aculeus, cloſe to the head of Pegaſus; Sagittarius ſetting in the ſouth-weſt; Antinous and Sobieſki's Shield below Aquila; the Fox and Gooſe between Aquila and Cygnus; the Greyhounds and Berenice's Hair between Boötes and Urſa Major, and Leo Minor below Urſa Major *."

* *Bruce's Introduction to Geography and Aſtronomy*, 2d ed. p. 262

The aſtronomical terms that we muſt here employ in deſcribing the method of performing the problems on the celeſtial globe, will be found explained in the article ASTRONOMY, or under their proper heads in the general alphabet of this work. See ASCENSION, AZIMUTH, DECLINATION, &c.

PROBLEM

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103 Problems respecting the ſtars.

PROBLEM II. *To find the right aſcenſion and declination of any given ſtar.*

Bring the given ſtar below the brazen meridian, and mark the degree of the meridian under which it lies. That degree ſhews the declination of the ſtar, and the degree of the equator cut by the meridian gives the ſtar's right aſcenſion.

The right aſcenſion of a ſtar may alſo be found by placing the globe in the poſition of a right ſphere, and then bringing the ſtar to the eaſtern part of the horizon; for that point of the equator which comes to the horizon at the ſame time with the ſtar, marks its right aſcenſion. See ASTRONOMY, N° 249, 250.

Ex. 1. What is the right aſcenſion and declination of the ſtar Sirius? *Anſ.* Its right aſcenſion is 99°, and its declination 16° 27′ S.

Ex. 2. Required the right aſcenſion and declination of Aldebaran, or the ſtar in the Bull's Eye marked α? *Anſ.* Its right aſcenſion is 66°, and its declination 16° 5′ N.

PROBLEM III. *Having the right aſcenſion and declination of a ſtar given, to find the ſtar on the globe.*

Bring the degree of the equator which marks the right aſcenſion below the brazen meridian, and counting along the meridian towards the north or ſouth, as far as the degree of declination, the required ſtar will be there found.

Ex. 1. The right aſcenſion of a certain ſtar is 162° 15′ and its declination is 57° 27′ N.; What is the name of the ſtar? *Anſ.* The lower pointer of Urſa Major, marked β.

Ex. 2. The right aſcenſion of Arcturus is 211° 30′, and its declination is 20° 13′ N.: it is required to find it on the globe.

This problem is extremely uſeful in diſcovering the names and relative ſituations of the different ſtars.

PROBLEM IV. *To find the latitude and longitude of a given ſtar.*

Bring the ſolſtitial colure (ſee N° 75.) below the brazen meridian, and there fix the quadrant of altitude over the pole of the ecliptic which is in the ſame hemiſphere with the given ſtar. Then, keeping the globe ſteady, bring the graduated edge of the quadrant over the given ſtar, and the degree of the quadrant cut by the ſtar, counted from the ecliptic, marks its latitude, and the degree of the ecliptic that is cut by the quadrant is the longitude of the given ſtar (H). See ASTRONOMY, N° 252, 253.

Ex. 1. What is the latitude and longitude of Arcturus? *Anſ.* Lat. 31° N. Long. Libra 20°.

Ex. 2. What is the latitude and longitude of Capella? *Anſ.* Lat. 23° N. Long. Gemini 18° 30′.

PROBLEM V. *Having the day of the month given, to find at what hour any ſtar comes below the meridian.*

Find the ſun's place, and bring it to the meridian, and ſet the horary index to XII.; turn the globe till the given ſtar come below the meridian, and the index will point out the hour.

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To know whether the hour is in the forenoon or afternoon, it is neceſſary to obſerve, that if the ſtar be to the eaſt of the ſun, it will reach the meridian later than the ſun, but if it be to the weſt of that luminary, it will come to the meridian ſooner: hence, in the former caſe, the hour will be P. M. and in the latter A. M.

Ex. 1. At what hour does Sirius come to the meridian on the 9th of February? *Anſ.* At 7 minutes paſt 9 P. M.

Ex. 2. Required the hour when Caſtor paſſes the meridian on the ſame day. *Anſ.* At 52 minutes paſt 9 P. M.

PROBLEM VI. *Having any ſtar given, and a given hour, to find on what day the ſtar will come to the meridian at a given hour.*

Bring the given ſtar below the meridian, and ſet the horary index to the given hour. Make the globe revolve till the index come to twelve at noon; and the day of the month which correſponds to the degree of the ecliptic then below the meridian, found in the calendar circle of the wooden horizon, will be the day required.

Ex. 1. On what day does Algenib, the firſt ſtar of Perſeus, come to the meridian at midnight? *Anſ.* On the 13th of November.

Ex. 2. On what day does Arcturus come to the meridian at 9 o'clock P. M. *Anſ.* On the 10th of June.

PROBLEM VII. *Having the latitude, the day of the month and the hour of the night given, to find the altitude and azimuth of any given ſtar.*

Rectify the globe for the given latitude; bring the ſun's place below the meridian, and ſet the horary index at XII. then turn the globe till the index point at the given hour. Fix the quadrant of altitude at 90° from the horizon, that is, in the zenith, and bring its graduated edge over the place of the ſtar: the degree of the quadrant intercepted between the horizon and the ſtar is the altitude required; and the diſtance between the foot of the quadrant and the neareſt part of the horizon, will be the azimuth.

It is evident that this problem on the celeſtial globe is exactly ſimilar to Problem XIII. on the terreſtrial globe, for finding the altitude of the ſun.

Ex. 1. What will be the altitude and azimuth of Cor Hydræ on the 21ſt of December at London, at 4 o'clock A. M.? *Anſ.* The altitude 30°, the azimuth S. 14° W.

Ex. 2. Suppoſe an obſerver at the Cape of Good Hope, on the 21ſt of June at midnight; required the altitude and azimuth of Arcturus to him? *Anſ.* Altitude 12°, azimuth N. 55° W.

PROBLEM VIII. *Having given the azimuth of any given ſtar, and the day of the month in a given latitude; to find the hour of the night, and altitude of the ſtar.*

Rectify the globe as in the laſt problem; fix the quadrant of altitude in the zenith, and bring it to the given aziumth. Turn the globe till the ſtar comes be-

(H) It muſt be remembered that the longitude of the heavenly bodies is not eſtimated in degrees and minutes like their right aſcenſion, but in ſigns, degrees, and minutes, as the ſun's place is reckoned.

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low the graduated edge of the quadrant, when the horary index will point out the hour, and the altitude of the ſtar will be ſeen by the quadrant.

Ex. Suppoſe the azimuth of Dubhe to be N. 23° W. at London on the firſt of September; it is required to find the altitude of the ſtar, and the hour of the night? *Anſ.* The altitude of Dubhe at that time is 31°, and the hour is 9 o'clock P. M.

PROBLEM IX. *The latitude of the place, the altitude of a ſtar, and the day of the month, being given; to find the azimuth and the hour of the night.*

Rectify the globe as before, and having fixed the quadrant of altitude in the zenith, turn the globe and quadrant of altitude till the latter comes over the ſtar at the given degree of altitude. In this poſition the index will ſhew the time of night, and the poſition of the quadrant at the horizon will ſhew the azimuth of the ſtar.

In the ſame way the hour of the night and the azimuth of the ſun may be found, by fixing a patch on the globe in the ſun's place, and bringing it to the quadrant as directed for the ſtar.

As the ſun and ſtars have the ſame altitude twice in the day, it is proper to know whether they are to be eaſt or weſt of the meridian; or whether the hour required be in the evening or the morning.

Ex. At Edinburgh, on the 25th of December, in the forenoon, when the ſun's altitude is 7° 20′, required the hour and the ſun's azimuth? *Anſ.* It is 10 o'clock A. M. and the ſun's azimuth is S. 27° 30′ E.

PROBLEM X. *Having the azimuth of the ſun or a ſtar, the latitude of the place, and the hour of the day given; to find the altitude and day of the month.*

Rectify the globe for the latitude of the place, fix the quadrant in the zenith, and bring its edge under the given azimuth. Bring the ſun's place or the ſtar to the edge of the quadrant, and ſet the index at the given hour. The degree marked in the quadrant will ſhew the altitude; and if the globe be turned till the index points to twelve at noon, the day of the month, anſwering to that degree of the ecliptic which is interſected by the brazen meridian, is the day required.

Ex. The azimuth of the ſtar α in the Northern Crown was obſerved at London at 9 o'clock P. M. to be S. 89° W.; required the altitude and day of the month? *Anſ.* Altitude 38°; day of the month 1ſt of September.

PROBLEM XI. *Having obſerved two ſtars to have the ſame azimuth; to find the hour of the night.*

Rectify the globe as before; turn the globe and move the quadrant till the edge of the latter comes over both ſtars, and the horary index in this poſition of the globe will give the hour required.

The following is a ſimple and eaſy method of finding when two ſtars have the ſame azimuth. Hold a ſmall line with a plummet at its lower extremity between the eye and the two ſtars, and if both ſtars fall within the line, they have the ſame azimuth. The ſame may be done by obſerving when any two ſtars paſs behind the perpendicular edge of a wall at the ſame time.

Ex. Vega and Atair were obſerved to have the ſame azimuth at London on the 11th of May; required the hour of the night? *Anſ.* 15 minutes paſt 2 A. M.

This problem may be applied to the regulating of clocks and watches, by reducing apparent to real time, as explained under ASTRONOMY. Principles and Practice.

PROBLEM XII. *To find the riſing, ſetting, and culminating of any ſtar or planet, its continuance above the horizon, its oblique aſcenſion and deſcenſion, and its eaſtern and weſtern amplitude; the place and day being given.*

Rectify the globe as in the foregoing problems; bring the given ſtar or the given planet (finding its place in an ephemeris for the given day, and marking it by a patch on the globe) to the eaſtern part of the horizon, and the index of the hour circle will point out the time of riſing: the degree of the equator that comes to the horizon with the given ſtar or planet, marks its oblique aſcenſion, and the eaſtern amplitude is ſhewn by the diſtance of the ſtar or planet from the eaſtern part of the horizon.

Bring the ſtar or planet to the meridian, and the index will point to the time of its culminating.

Move the globe till the ſtar or planet come to the weſtern part of the horizon, and the time of its ſetting, its oblique deſcenſion, and its weſtern amplitude, may be found in the ſame manner as directed above; for its riſing, oblique aſcenſion, and eaſtern amplitude, the number of hours paſſed over by the index, while the ſtar or planet is moving from eaſt to weſt, will ſhew the time of its continuance above the horizon.

Ex. 1. Required the above circumſtances with reſpect to Sirius on the 14th of March at London. *Anſ.* It riſes at 24 minutes paſt two P. M.; comes to the meridian, or culminates, at 57 minutes paſt ſix P. M.; and ſets at half-paſt eleven P. M. Hence it remains above the horizon nine hours and ſix minutes. Its oblique aſcenſion is 120° 47′, its oblique deſcenſion 77° 17′, and its amplitude 27° S.

Ex. 2. It is required to find the ſituation of the ſeveral planets on the 19th of January 1806. *Anſ.* Mercury is about 22° to the weſt of the ſun, and riſes ſouth-eaſt by eaſt, at 20 minutes before ſeven A. M. Venus is an evening ſtar, and ſets about half paſt eight. Mars is a very little to the eaſt of the ſun, and riſes and ſets ſo near the ſame time with the ſun, that he cannot be ſeen. Jupiter is a morning ſtar, and riſes about ſix o'clock. Saturn is a little to the eaſt of the ſtar Spica Virginis, and riſes about half an hour after midnight. Herſchel is very near Saturn, and riſes about the ſame time.

PROBLEM XIII. *To find thoſe ſtars which never riſe, and thoſe which never ſet, in a given latitude.*

Rectify the globe for the latitude of the place; then, holding a black lead pencil ſo as to touch the ſurface of the globe at the northern point of the horizon, turn the globe, ſo that the pencil may deſcribe a circle: all the ſtars which are between this circle and the elevated pole, never ſet. Again, holding the pencil at the ſouthern point of the horizon, turn the globe ſo as to deſcribe another circle there, and all the ſtars that are between that circle and the pole, below the horizon, never riſe.

If the place is in ſouthern latitude, the ſtars that never ſet are found by deſcribing a circle at the ſouthern point

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point of the horizon, and thoſe that never riſe by a ſimilar circle at the northern point (1).

103 Harveſt moon illuſtrated.

Throughout almoſt the whole year, the moon riſes later every ſucceſſive day, by above three quarters of an hour; but at a conſiderable diſtance from the equator, as in the latitude of Britain, France, and ſome other countries, a remarkable anomaly takes place in the moon's motion about the time of harveſt. At this ſeaſon, when the moon is about full, ſhe riſes for ſeveral nights ſucceſſively at about 17 minutes later only than on the preceding day. This is attended with conſiderable advantage, for as the moon riſes before twilight is well ended, the light is as it were prolonged, and thus an opportunity given to the induſtrious farmer to continue longer in the field, for the purpoſe of gathering in the fruits of the earth. From the advantage derived from the full moon at the ſeaſon of harveſt, it has been called the *harveſt moon*. The following problem has been contrived for the purpoſe of illuſtrating the phenomenon by means of the globe.

Problem XIV.

Rectify the globe for any conſiderable northern latitude, ſuppoſe that of London. As the angle which the moon's orbit makes with the ecliptic is but ſmall, we may ſuppoſe, without any conſiderable error, her orbit to be repreſented by the ecliptic. In September the ſun is in the beginning of ♎, ſo that the moon, when full, being in oppoſition to the ſun, muſt be in or near the beginning of ♈. Put a patch, therefore, in the globe at the firſt point of ♈ in the ecliptic; and as the moon's mean motion is about 13° in a day, put another patch on the ecliptic 13° beyond the former, and it will point out the moon's place the night after it is full. A third and fourth patch, put at the diſtance of 13° further on, will ſhew the moon's place on the ſecond and third nights after full, &c. Now, bring the firſt patch to the horizon, and obſerve the hour pointed out by the index; turn the globe till the ſecond patch comes to the horizon, and it will appear by the index that there are only 17 minutes between the time of the firſt patch riſing, and that of the ſecond. This ſmall difference in the motion of the moon evidently ariſes from the ſmall angle which her orbit makes with the horizon. The remaining patches will come to the horizon with a little greater difference of time, and this difference will gradually increaſe as the moon advances in the ecliptic; but for the firſt week after the full moon at harveſt the difference will not be more than two hours. If patches be continued on to the firſt point in ♎, it will be found that the time of their riſing, or coming to the horizon, will increaſe conſiderably till the laſt will be above 1¼ hour later in coming to the horizon, becauſe that point of the ecliptic makes the greateſt angle with the horizon.

The point of the ecliptic, which makes the leaſt angle with the horizon at riſing, makes the greateſt angle at ſetting; and, conſequently, when the difference is leaſt at the time of riſing, it is greateſt at the time of ſetting.

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Problem XV. *To explain the equation of time by the globe.*

104 Equation of time illuſtrated.

The difference between apparent time and mean or equal time, has been explained in Astronomy, from N° 50 to 60; and the method of computing the equation of time is alſo there deſcribed.

To explain the equation of time on the globe, make, with a black lead pencil, marks all round the equator and ecliptic, beginning with ♈, at equal diſtances from each other, ſuppoſe about 15°. Then, on turning the globe, it will be ſeen that all the marks on the firſt quadrant of the ecliptic, reckoning from ♈ to ♋, come to the brazen meridian ſooner than the correſponding marks on the firſt quadrant of the equator. Now, as the former marks repreſent time as meaſured by the ſun, or a dial, and the latter repreſent it as meaſured by an accurate clock, it will be evident, that through the firſt quarter the dial is faſter than the clock.

Still turning the globe, it will be ſeen that the marks on the ſecond quarter of the ecliptic, reckoning from ♋ to ♎, come to the meridian later than the correſponding marks of the equator; conſequently in this quarter the ſun or the dial is ſlower than the clock. By moving the globe round, and marking the approach of the dots in the third quadrant, it will be ſeen that, as in the firſt, the dial now precedes the clock, and in the fourth quadrant, that it is behind it, according to the explanation given in Astronomy.

Sect. III. *Of the Conſtruction of Globes.*

105 General conſtruction of globes.

The conſtruction of globes is of conſiderable importance; as, in performing the problems in which they are employed, very much depends on the accuracy with which they have been conſtructed. We ſhall here, therefore, deſcribe pretty minutely the methods in which the artiſts of Britain and France make their globes.

There are certain general circumſtances which are attended to in the conſtruction of every globe.

There is firſt provided a wooden axis, ſomewhat leſs than the intended diameter of the globe, and to the extremities of this axis, which is the baſis of the whole ſucceeding ſtructure, there are fixed two metallic wires, to ſerve as poles. Now, two hemiſpherical caps formed on a wooden mould or clock, are applied in the axis. Theſe caps are compoſed of paſteboard, or folds of paper laid one over another on the mould, till they are of the thickneſs of a crown piece; and after the whole has ſtood to dry, and has become a ſolid body, an inciſion is made with a ſharp knife along the middle, and the two caps are thus ſlipped off the mould. Theſe caps are now to be applied on the poles of the axis, as they were before on thoſe of the mould; and to fix them

(1) This problem may be performed without the globe, by the following method. Find the latitude of the place in a table, and ſubtract it from 90°; the remainder will be the complement of the latitude. Then, if the declination of the given ſtar be of the ſame name with the co-latitude, and exceed it in quantity, it will never ſet. If it be of a contrary name, and exceed it, it will never riſe.

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them firmly on the axis, the two edges are ſewed together with packthread.

When the rudiments of the globe are thus laid, the artiſt proceeds to ſtrengthen the work, and make the ſurface ſmooth and equal. For this purpoſe, the two poles are fixed in a metallic ſemicircle, of the propoſed ſize; and a compoſition made of whitening, mixed with water and glue, heated, melted, and incorporated together, is daubed all over the paper ſurface. While the plaſter is applied, the globe is turned round in the ſemicircle, the edge of which pares away all the matter that is ſuperfluous and exceeds the proper dimenſions, and ſpreads the reſt over thoſe parts that require it. After this operation the ball ſtands to dry, and when it is thoroughly dried, it is again put in the ſemicircle, and freſh plaſter applied to it; and thus they continue to apply compoſition and dry the ball alternately, till the ſurface accurately touches the ſemicircle in every point, when it becomes perfectly firm, ſmooth, and equal.

When the ball of the globe is thus finiſhed, the map, containing a delineation of the ſurface of the earth, is to be paſted on the globe. For this purpoſe, the map is engraved in ſeveral gores or guſſets, ſo that when theſe are accurately joined together on the ſpherical ſurface, they may cover every part of the ball, without overlapping each other. The greateſt nicety is required in forming theſe engraved guſſets, as well in the accuracy of the engraving, as in the choice and ſhape of the paper employed. The method of deſcribing the gores or guſſets, uſually employed by the Britiſh artiſts, is as follows.

1. From the given diameter of the globe there is found a right line AB (fig. 12.), equal to the circumference of a great circle correſponding to that diameter; and this line is divided into 12 equal parts.

2. Through the ſeveral points of diviſion, 1, 2, 3, 4, &c. with a diſtance equal to ten of the diviſions, arches are deſcribed croſſing each other as in D and E; and theſe figures are paſted on the globe, ſo as when joined together to cover its whole ſurface.

3. Each part of the line AB is divided into 30 equal parts, ſo that the whole line, which may repreſent the equator, is divided into 360°.

4. From the points D and E, which repreſent the poles, with a diſtance $=23\frac{1}{2}°$, there are deſcribed arches *a b*, *a b*, (fig. 13.) which form twelfth parts of the polar circles.

5. In a ſimilar manner about the ſame poles D and E, with a diſtance $=66\frac{1}{2}°$, reckoned from the equator, there are deſcribed other arches, *c d*, *c d*, which are the twelfth parts of the tropics.

6. In forming the celeſtial globe, through the point of the equator marked *e* (fig. 13.) repreſenting the right aſcenſion of a given ſtar, and through the two poles D and E, there is drawn an arch of a circle; and if the complement of the declination from the pole D be taken in the compaſſes, and an arch be deſcribed, interſecting the former in the point *i*, this point *i* will be the place of the given ſtar.

7. In this way all the ſtars of each conſtellation are laid down, and the circumſcribing outline of the conſtellation is drawn as figured in the tables of Bayer, Flamſtead, &c.

8. In the ſame manner are determined the declinations and right aſcenſions of every degree of the ecliptic, *d*, *g*.

The above is the method deſcribed by Mr Chambers, of laying down or delineating the gores of a celeſtial globe. Thoſe of the terreſtrial globe are delineated in much the ſame manner, only that every place is laid down on the gores, according to its longitude and latitude, determined by the interſection of circles; and then the outline of the coaſts, boundaries of countries, &c. are added, like the figures of the conſtellations above mentioned.

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9. When the ſurface of the globe has been thus projected on a plane, the guſſets are to be engraved on copper, to ſave the trouble of making a new projection for every globe.

10. In the mean time, a ball of paper, plaſter, or the like, of the intended diameter of the globe, is prepared in the manner above deſcribed, and by means of a ſemicircle and ſtyle, great circles are drawn on its ſurface, ſo as to divide it into a number of equal parts, correſponding to the number of guſſets; and ſubdividing each of theſe according to the other lines and diviſions of the globe. When the ball is thus prepared, the guſſets are to be accurately cut from the printed engraving, and paſted on the ball.

When the papers have been thus paſted on, and ſuffered to dry, nothing remains but to colour and illuminate the globe, and to cover it with a thin layer of the fineſt varniſh, that it may the better reſiſt duſt and moiſture. The ball of the globe is now finiſhed, and is to be hung in a ſtrong brazen meridian furniſhed with hour circles and a quadrant of altitude, and fitted into a ſtrong wooden horizon.

106 Method of forming the gores.

The method employed by the French artiſts in projecting the guſſets of globes, is thus deſcribed by M. La Lande.

"To form celeſtial and terreſtrial globes, it is neceſſary to engrave gores, which are a ſort of projection or developement of the globe. The length PC (fig. 14.) of the axis of the curve, is equal to a fourth part of the circumference of the intended globe; the intervals of the parallels on the axis PC are all equal; the radii of the circles K D I, which repreſent the parallels, are equal to the co-tangents of the latitude, and the arches of each, ſuch as KI, are nearly equal to the number of degrees that correſpond to the breadth of the gore (uſually 30°), multiplied by the ſine of the latitude: thus, there will be found no difficulty in tracing them; but the principal difficulty proceeds from the change which thoſe parts of the gores undergo, when they are glued upon the globe; as, in order to adjuſt them to the ſpace which they ought to occupy, it is neceſſary to make the paper leſs on the ſides than in the middle, becauſe the ſides are too long.

"The method employed by artiſts for engraving theſe gores, is thus deſcribed by Bion (*Uſage des Globes*, tom. iii.), and by Robert de Vaugondy in the ſeventh volume of the Encyclopedié, and this method is ſufficient for practical purpoſes.

"Draw on the paper a line AC, equal to the chord of 15°, to make the half breadth of the gore; and a perpendicular PC, equal to three times the chord of 30°, to make the half length: for theſe papers, the dimenſions of which will be equal to the chords, become equal to the arcs themſelves when they are paſted on the globe. Divide the height CP into nine parts, if the parallels are to be drawn in every 10°; divide alſo the quadrant BE into nine equal parts; through each diviſion

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vision point of the quadrant, as G, and through the corresponding point D of the right line CP, draw the perpendiculars HGF and DF, the meeting of which in F gives one of the points of the curve BFP, which will terminate the circumference of the gore. When a sufficient number of points are thus found, trace the outline PIB with a curved rule. By this construction are given the gore breadths, which are on the globe, in the ratio of the cosines of the latitudes, supposing those breadths taken perpendicular to CD, which is not very exact; but it is impossible to prescribe a rigid operation sufficient to make a plane which shall cover a curved surface, and that on a right line AB shall make lines PA, PC, PD, equal to each other, as they ought to be on the globe. To describe the circle KDI, which is at the distance of 30° from the equator, there must be taken above O, a point that shall be distant from D the value of the tangent of 60°, which may be taken either from tables, or may be measured on a circle equal to the circumference of the globe that is to be drawn; this point will serve as a centre for the parallel DI, which ought to pass through the point D; for it is supposed equal to that of a cone circumscribing the globe, and which would touch it at the point D.

"The meridians are traced to every 10°, by dividing each parallel, as KI, into three equal parts at the points L and M, and drawing from the pole P, through all these points of division, curves which represent the intermediate meridians lying between PA and PB, such as BR and ST (fig. 15.).

"The ecliptic AQ (fig. 15.) is traced by means of the known declination, from different points of the equator, as found in the tables; for 10° it is equal to 3° 58′; for 20°=7° 50′=BQ 20; for 30°=11° 29′, &c."

In general, it is observed that the paper on which maps are printed, such as that called in France *colombier*, contracts itself $\frac{1}{72}$, or a line in six inches, upon an average, when it is dried after printing; hence it is necessary to prevent this inconvenience in engraving the gores: if, however, notwithstanding this, the gores are still found too short, it must be remedied by taking from the surface of the ball a little of the white with which it is covered; thus making the dimensions of the ball correspond to those of the gores as they are printed. But, what is singular, in drawing the gore, moistened with the paste to apply it on the globe, the axis GH lengthens, and the side AN shortens in such a manner that neither the length of the side ACK, nor that of the axis GEH of the gore are exactly equal to the quarter of the circumference of the quarter of the globe, when compared to the figure on the copper, or to the numbers shewn on the side of fig. 15.

"Mr Bonne having made several experiments on the dimensions which the gores take after being covered with paste in order to apply them to the globe, especially of the paper called *jesus*, which had been employed in covering globes of a foot in diameter; found that it was necessary to give to the gore engraved on copper the dimensions laid down in fig. 15. Supposing that the radius of the globe contains 720 parts, the half of the breadth of the gore AG=188.5; the distance AC for the parallel of 10° taken on the straight line LM is =128.1, the small deviation from the parallel of 10° in the middle of the gore ED is 4, the line ABN is a straight line, the radius of the parallel of 10° or of the circle CET, is 4083, &c. The small circular cap which is placed under H, has its radius 253, instead of 247, which it would have if the fine of 20° had been the radius of it*."

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* *La Lande Astronomie*, tom. iii. p. 610. 3d ed.

Globes are made of various sizes, from a diameter of three inches, to that of as many feet; but their most usual diameter is that of 18 inches, which are sufficiently large for most of the purposes for which globes are employed. Some large globes were made about 100 years ago, in France, by P. Coronelli, a Franciscan monk, which were in considerable reputation. They were engraved, and the plates are still to be seen at Paris, at the house of M. Desnos, in the Rue St Jacques. There are some large globes at Cambridge, which were drawn by the hand; but the largest globes of which we have any account, are those which were made for the late unfortunate Louis XVI. and were kept in the palace of Marly. They were 12 feet in diameter, and we believe, are still existing at Paris, where they occupy four entire rooms, each of them being partly in an upper room, and partly in that below it, the floor of the upper room forming the horizon.

The account which we have given of the method of constructing globes, will be useful to those who purchase these instruments; but to assist them still further, we shall subjoin the following practical rules for the choice of globes.

107 Rules for choosing globes.

1. The papers should be well and neatly pasted on the globes, which may be known by the lines and circles meeting exactly, and continuing all the way even and whole; the circles not breaking into several arches, nor the papers either coming short, or lapping over one another.

2. The colours should be transparent, and not laid too thick upon the globe, to hide the names of the places.

3. The globe should hang evenly between the brazen meridian and the wooden horizon, not inclining either to the one side or the other.

4. The globe should move as close to the horizon and the meridian as it conveniently may, otherwise there will be too much trouble to find against what part of the globe any degree of the meridian or horizon is.

5. The equinoctial line should be even with the horizon all round, when the north or south pole is elevated 90° above the horizon.

6. The equinoctial line should cut the horizon in the east and west points, in all the elevations of the pole from 0 to 90°.

7. The degree of the brazen meridian marked 0, should be exactly over the equinoctial line of the globe.

8. Exactly half of the brazen meridian should be above the horizon, which may be known by bringing any of the decimal divisions on the meridian to the north point of the horizon, and finding their complement to 90° on the south point.

9. When the quadrant of altitude is placed as far from the equator, or the brazen meridian, as the pole is elevated above the horizon, the beginning of the degrees of the quadrant should reach just to the plane surface of the horizon.

10. When the index of the hour circle passes from one

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one hour to another, 15 degrees of the equator must pass under the graduated edge of the brazen meridian.

11. The wooden horizon should be made substantial and strong; it being generally observed, that, in most globes, the horizon is the first part that fails, on account of its having been made too slight.

108 In using a globe, the eastern side of the horizon should be kept towards the observer, (unless in particular problems which require a different position); and that side may be known by the word *east* on the horizon. In this position the observer will have the graduated side of the meridian towards him, and the quadrant of altitude directly before him; and the globe will be exactly divided into two equal parts by the graduated side of the meridian.

In performing some problems, it will be necessary to turn about the whole globe and horizon, in order to look at the west side; but this turning will be apt to disturb the ball, so as to shift away that degree of the globe which was before set to the horizon or meridian. This inconvenience may be avoided by thrusting the feather end of a quill between the ball of the globe and the brazen meridian, and thus, without injuring the surface of the globe, it will be kept from turning in the meridian, while the whole is moved round, so as to examine the western side.

We have already mentioned some improvements which have been made on the globes, for the purpose of remedying the defect in the old construction, of placing the hour circles on the outside of the brazen meridian. Some other improvements and modifications have been contrived by various artists; but of these we shall only mention those of Mr Senex, Mr B. Martin, Mr Smeaton, and Mr Adams.

109 Mr Senex's improvement in the globes.

Mr John Senex, F.R.S. invented a contrivance for remedying these defects, by fixing the poles of the diurnal motion to two shoulders or arms of brass, at the distance of $23\frac{1}{2}°$ from the poles of the ecliptic. These shoulders are strongly fastened at the other end to an iron axis, which passes through the poles of the ecliptic, and is made to move round with a very stiff motion; so that when it is adjusted to any point of the ecliptic which the equator is made to intersect, the diurnal motion of the globe on its axis will not disturb it. When it is to be adjusted for any particular time, either past or future, one of the brazen shoulders is brought under the meridian, and held fast to it with one hand, while the globe is turned about with the other; so that the point of the ecliptic which the equator is to intersect may pass under the 0 degree of the brazen meridian; then holding a pencil to that point, and turning the globe about, it will describe the equator according to its position at the time required; and transferring the pencil to $23\frac{1}{2}$ and $66\frac{1}{2}$ degrees on the brazen meridian, the tropics and polar circles will be so described for the same time. By this contrivance, the celestial globe may be so adjusted, as to exhibit not only the rising and setting of the stars in all ages and in all latitudes, but likewise the other phenomena that depend upon the motion of the diurnal round the annual axis. Senex's celestial globes, especially the two greatest, of 27 and 28 inches in diameter, have been constructed upon this principle; so that by means of a nut and screw, the pole of the equator is made to revolve about the pole of the ecliptic.

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To represent the above appearances in the most natural and easy manner, Mr B. Martin applied to the contrivance of Mr Senex a moveable equinoctial and solstitial colure, a moveable equinoctial circle, and a moveable ecliptic; all so connected together as to represent those imaginary circles in the heavens for any age of the world.

110 Improvements by Mr Smeaton.

In order to the performance of the problems which relate to the altitudes and azimuths of celestial objects, Mr Smeaton, F.R.S. has made some improvements applicable to the celestial globe; and to give some idea of the construction, they may be described as follows: Instead of a thin flexible slip of brass, which generally accompanies the quadrant of altitude, Mr Smeaton substitutes an arch or a circle of the same radius, breadth, and substance, as the brass meridian, divided into degrees, &c. similar to the divisions of that circle, and which, on account of its strength, is not liable to be bent out of the plane of a vertical circle, as is usual with the common quadrant put to globes. That end of this circular arch at which the division begins, rests on the horizon, being filed off square to fit and rest steadily on it throughout its whole breadth; and the upper end of the arch is firmly attached, by means of an arm, to a vertical socket, in such a manner that when the lower end of the arch rests on the horizon, the lower end of this socket shall rest on the upper end of the brass meridian, directly over the zenith of the globe. This socket is fitted to and ground with a steel spindle of the length, so that it will turn freely on it without shaking; and the steel spindle has an apparatus attached to its lower end, by which it can be fastened in a vertical position to the brass meridian, with its centre directly over the zenith point of the globe. The spindle being fixed firmly in this position, and the socket which is attached to the circular arch put on it, and so adjusted that the lower end of the arch just rests on and fits close to the horizon; it is evident that the altitude of any object above the horizon will be shewn by the degree which it intersects on this arch, and its azimuth by that end of the arch which rests on the horizon.

Besides this improvement, Mr Smeaton proposes that, instead of fixing the hour index, as is usually done, on one end of the axis, it be placed in such a manner that its upper surface may move in the plane of the hour circle rather than above it. To effect this, he directs the extremity of the index to be filed off so as to form a circular arc, of the same radius with the inner edge of the hour circle, to which it is made to fit exactly, and a fine line is drawn in the middle of its upper surface, to point out the hour, instead of the tapering point usually employed. By this contrivance, if the hour circle be made four inches in diameter, the time may be shewn to half a minute. For a more particular account of Mr Smeaton's improvements, we refer the reader to the 79th volume of the Philosophical Transactions.

Another improvement of the celestial globe, by which it is better adapted to astronomical purposes, is described in the article ASTRONOMY, Vol. III. p. 178.

111 Adams's late improvements.

Besides the modifications in the construction of globes, introduced by Mr Adams, and which have been already

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ready described, there are some others which we must briefly mention, respecting principally the placing the globe in an inclined position, and fitting it with a moveable or floating meridian and horizon.

The globes constructed after this manner do not hang in a frame like the ordinary globes, but are fixed on a pedestal, and supported by an axis which is inclined $66\frac{1}{2}^{\circ}$ to the ecliptic, and is of course always parallel to the axis of the earth, supposing the orbit of this planet to be parallel to the ecliptic. On the pedestal below the globe is a graduated circle, marked with the signs and degrees of the ecliptic; and adjoining to this is a circle of months and days, answering to every degree of the ecliptic; and within this is a third circle shewing the sun's declination for every day of the month. There is a moveable arm on the pedestal, which being set to the day of the month, immediately points out the sun's place and declination.

Round the globe there is a circle representing the horizon of any place, and at right angles to this is fixed a semicircle, serving for a general meridian. The middle point of this semicircle serves to represent the situation of any inhabitant on the earth; for this purpose there is fixed a steel pin over the middle point of this semicircle,

Mr Adams alleges that only one supposition is necessary for performing every problem with this globe, namely, that a spherical luminous body will enlighten one half of a spherical opaque body, and consequently that a circle at right angles with the central solar ray, and dividing the globe in half, will be a terminator shewing the boundary of light and darkness for any given day. For this purpose, at the end of the moveable arm, opposite to the sun, there is a pillar, from the top of which projects a piece carrying a circle that surrounds the globe, dividing it into equal portions, and separating the illuminated from the dark parts; and 18° behind this there is another circle parallel to it, representing the limit of twilight.

There are two plates below the globe, which are turned by the diurnal revolution of the globe, each of them being divided into twice 12 hours, and on the outside being marked with the degrees of longitude corresponding to every hour; so that these circles give at sight the hour of the day at any two places on the globe, and the corresponding difference of longitude.

The celestial globe is mounted in a similar manner, except that it is fixed on the axis, and the ecliptic exactly coincides with the sun's apparent path from the earth *.

* *Adams's Lectures*, vol. iv. p. 199.

Sect. IV. *Of the Armillary Sphere.*

112 Armillary Sphere.

If a machine be constructed that is composed only of the circles of the sphere, and made so as to revolve like a globe, a great many of the most useful problems relating to the heavenly bodies may be solved by it. An instrument of this kind is called an *armillary sphere*, and of these there are various forms. One of the most convenient is that contrived by the late Mr James Ferguson, and is thus described in his Lectures. It is represented at fig. 16.

The exterior parts of this machine are a compages of brass rings, which represent the principal circles of the heaven, viz. 1. The equinoctial AA, which is divided into 360 degrees, (beginning at its intersection with the ecliptic in Aries) for shewing the sun's right ascension in degrees; and also into 24 hours, for shewing his right ascension in time. 2. The ecliptic BB, which is divided into 12 signs, and each sign into 30 degrees, and also into the months and days of the year, in such a manner, that the degrees or points of the ecliptic in which the sun is on any given day, stands over that day in the circle of months. 3. The tropic of *Cancer*, CC, touching the ecliptic at the beginning of Cancer in *e*; and the tropic of *Capricorn* DD, touching the ecliptic at the beginning of Capricorn in *f*; each $23\frac{1}{2}$ degrees from the equinoctial circle. 4. The Arctic circle E, and the Antarctic circle F, each $23\frac{1}{2}$ degrees from its respective pole at N and S. 5. The equinoctial colure GG, passing through the south and north poles of the heaven at N and S, and through the equinoctial points Aries and Libra, in the ecliptic. 6. The solstitial colure HH, passing through the poles of the heaven, and through the solstitial points Cancer and Capricorn, in the ecliptic. Each quarter of the former of these colures is divided into 90 degrees, from the equinoctial to the poles of the world, for shewing the declination of the sun, moon, and stars; and each quarter of the latter, from the ecliptic at *e* and *f*, to its poles *b* and *d*, for shewing the latitude of the stars.

In the north pole of the ecliptic is a nut *b*, to which is fixed one end of a quadrantal wire, and to the other end a small sun Y, which is carried round the ecliptic BB, by turning the nut: and in the south pole of the ecliptic is a pin at *d*, on which is another quadrantal wire, with a small moon Z upon it, which may be moved round by hand; but there is a particular contrivance for causing the moon to move in an orbit which crosses the ecliptic at an angle of $5\frac{1}{3}$ degrees, in two opposite points called the moon's nodes; and also for shifting these points backward in the ecliptic, as the moon's nodes shift in the heaven.

Within these circular rings is a small terrestrial globe I, fixed on the axis KK, which extends from the north and south poles of the globe at *n* and *s*. to those of the celestial sphere at N and S. On this axis is fixed the flat celestial meridian LL, which may be set directly over the meridian of any place on the globe, and then turned round with the globe, so as to keep over the same meridian upon it. This flat meridian is graduated the same way as the brass meridian of a common globe, and its use is much the same. To this globe is fitted the moveable horizon MM, so as to turn upon two strong wires proceeding from its east and west points to the globe, and entering the globe at opposite points of its equator, which is a moveable brass ring let into the globe in a groove all around its equator. The globe may be turned by hand within this ring, so as to place any given meridian upon it, directly under the celestial meridian LL. The horizon is divided into 360 degrees all around its outermost edge, within which are the points of the compass, for shewing the amplitude of the sun and moon, both in degrees and points. The celestian meridian LL, passes through two notches in the north and south points of the horizon, as in a common globe; but here, if the globe be turned round, the horizon and the meridian turn with it. At the south pole

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of the ſphere is a circle of 24 hours, fixed to the rings, and on the axis is an index which goes round that circle, if the globe be turned round its axis.

The whole fabric is ſupported on a pedeſtal N, and may be elevated or depreſſed upon the joint O, to any number of degrees from 0 to 90, by means of the arc P, which is fixed into the ſtrong braſs arm Q, and ſlides in the upright piece R, in which is a ſcrew at *r*, to fix it at any proper elevation.

In the box T are two wheels and two pinions, whoſe axes come out at V and U; either of which may be turned by the ſmall winch W. When the winch is put upon the axis V, and turned backward, the terreſtrial globe, with its horizon and celeſtial meridian, keep at reſt; and the whole ſphere of circles turns round from eaſt, by ſouth, to weſt, carrying the ſun Y, and moon Z, round the ſame way, cauſing them to riſe above and ſet below the horizon. But when the winch is put upon the axis U, and turned forward, the ſphere with the ſun and moon keep at reſt; and the earth, with its horizon and meridian, turn round from weſt, by ſouth, to eaſt; and bring the ſame points of the horizon to the ſun and moon, to which theſe bodies come when the earth kept at reſt, and they were carried round it; ſhewing that they riſe and ſet in the ſame points of the horizon, and at the ſame times in the hour circle, whether the motion be in the earth or in the heaven. If the earthly globe be turned, the hour index goes round its hour circle; but if the ſphere be turned, the hour circle goes round below the index.

And ſo, by this conſtruction, the machine is equally fitted to ſhew either the real motion of the earth, or the apparent motion of the heaven.

To rectify the ſphere for uſe, firſt ſlacken the ſcrew *r* in the upright ſtem R, and taking hold of the arm Q, move it up or down until the given degree of latitude for any place be at the ſide of the ſtem R; and then the axis of the ſphere will be properly elevated, ſo as to ſtand parallel to the axis of the world, if the machine be ſet north and ſouth by a ſmall compaſs; this done, count the latitude from the north pole upon the celeſtial meridian LL, down towards the north notch of the horizon, and ſet the horizon to that latitude; then turn the nut *b* until the ſun Y comes to the given day of the year in the ecliptic, and the ſun will be at its proper place for that day; find the place of the moon's aſcending node, and alſo the place of the moon, by an Ephemeris, and ſet them right accordingly; laſtly, turn the winch W, until either the ſun comes to the meridian LL, or until the meridian comes to the ſun (according as you want the ſphere or the earth to move), and ſet the hour index to the XII. marked noon, and the whole machine will be rectified. Then turn the winch, and obſerve when the ſun or moon riſe and ſet in the horizon, and the hour index will ſhew the times thereof for the given day.

Thoſe who have made themſelves acquainted with the uſe of the globes, as deſcribed in the firſt and ſecond ſections of this chapter, will be at no loſs to perform many problems reſpecting the motions of the heavenly bodies by means of this ſphere.

113 Dr Long's ſphere.

Dr Long, ſome years ago, conſtructed an armillary ſphere of glaſs, in Pembroke hall at Cambridge. It was 18 feet in diameter, and could contain below it more than 30 perſons, ſitting in ſuch a manner within the ſphere, as to view from its centre the repreſentation of the heavens drawn in its concavity. The lower part of the ſphere, or that part which is not viſible in the latitude of Britain, is wanting; and the whole apparatus is ſo contrived, that it may be turned round with as little exertion as is requiſite to wind up a common jack. Dr Long has given a deſcription of this ſphere, accompanied with a figure, in his Aſtronomy.

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The invention of the armillary ſphere is thought by La Lande to be as ancient as that of aſtronomy itſelf. It has been attributed to Atlas, to Hercules, to Anaximander, and Muſeus; while others have ſuppoſed that it originated in Egypt. The ſphere of Archimedes, which became ſo celebrated, appears to have been ſomething like that of Dr Long, as it was certainly compoſed of a globe of glaſs, which, beſides containing the circles of the ſphere, ſerved as a planetarium, and repreſented the motions of the planets. Claudian has celebrated it in ſome beautiful lines. See ARCHIMEDES.

A combination of the armillary ſphere with a planetarium was conſtructed by the late Mr George Adams, and is figured in Plate XIII. fig. 1. of his Aſtronomical and Geographical Eſſays.

CHAP. III. *Of the Conſtruction and Uſe of Maps and Charts.*

SECT. I. *Deſcription of Maps and Charts.*

114 Diſtinction of maps and charts.

IT has been ſeen, that the ſurface of the earth may be delineated, in the moſt accurate manner, on the ſurface of a globe or ſphere. This mode of delineation, however, can be employed only for the purpoſe of repreſenting the general form and relative proportions of countries on a very confined ſcale; and is, beſides, from its bulk and figure, not well ſuited to many of the purpoſes of the geographer. To obviate theſe inconveniences, recourſe has been had to maps and charts, or delineations of the earth's ſurface on a plane; where the form and boundaries of the ſeveral countries, and the objects moſt remarkable in each, whether by ſea or land, are repreſented according to the rules of perſpective, ſo as to preſerve the remembrance that they are parts of a ſpherical ſurface. In this way, the ſeveral countries or diſtricts of the earth may be repreſented on a larger ſcale, and delineations of this kind admit of more eaſy reference.

115 Deſcription of a map.

In maps, the circles of the ſphere, and the boundaries of the countries within them, are drawn as they would appear to an eye ſituated in ſome point of the ſphere, or at a conſiderable diſtance above it. In maps of any conſiderable extent of country, the meridians and parallels of latitude are circular lines, but, if the map repreſents only a ſmall diſtrict, as a province or county, thoſe circles become ſo large, that they may, without any conſiderable error, be repreſented by ſtraight lines. In charts, which are alſo called *hydrographical maps*, as they are repreſentations rather of the water than land, the meridians and parallels are uſually repreſented by ſtraight lines, croſſing each other at right angles, as in the ſmaller maps; and, in particular parts, there are drawn lines diverging from ſeveral points, in the direction of the points of the compaſs, in order to mark the

the bearings of particular places. In maps, the inland face of the country is chiefly regarded in the delineation; but in charts, which are deſigned for the purpoſes of navigation, the internal face of the land is left nearly blank, and only the ſea coaſt, with the principal objects on it, ſuch as churches, light-houſes, beacons, &c. are accurately delineated; while particular care is taken to mark the rocks, ſhoals, and quickſands in the ſea, that may endanger the ſafety of veſſels; the depths or ſoundings of the principal bays and harbours, and the direction of the winds, where theſe are ſtationary or peculiarly prevalent. Another diſtinction of maps and charts is, that in the former, the ſea-coaſt is ſhaded on the ſide next the land, while, in the latter, it is ſhaded towards the ſea.

In maps the upper ſide repreſents the north, the lower ſide the ſouth; that on the right hand the eaſt, and that on the left hand the weſt. All the margins of the map are graduated; the upper and lower ſhowing the degrees of longitude, and the right and left margins the degrees of latitude. (See fig. 1. to which the reader muſt refer in going over the following deſcription). If the map is on a ſmall ſcale, only every ten degrees of longitude or latitude are marked on the margin; but, if the map is drawn on a large ſcale, every degree is numbered, and ſometimes every half degree is marked with the number 30 in ſmaller figures. The ſpace included between every ten degrees in ſmall maps, or between every two degrees in thoſe on a larger ſcale, is uſually divided into ten ſpaces, which are alternately left blank, and marked with parallel lines, to denote the ſubdiviſions of ſingle degrees or minutes. Through every ten degrees of latitude a line is drawn, repreſenting a parallel of latitude; and through every ten degrees of longitude, or at ſmaller intervals in each, where the ſize of the map will admit of it, there are drawn lines repreſenting meridians. In ſome maps theſe lines are continued from ſide to ſide, or from top to bottom, acroſs both ſea and land; but in other maps, they are ſometimes only drawn acroſs the ſea. The firſt meridian, however, and the principal circles of the ſphere, as the equator, tropics, &c. ſhould always be drawn directly acroſs the map. In moſt maps, it is marked on the margins, whether the longitude is eaſt or weſt, and the latitude north or ſouth; but, if this is not marked, it may eaſily be known, by obſerving towards what part of the map the degrees increaſe. If the degrees of latitude increaſe from the lower to the upper part of the map, the country delineated lies in north latitude; but if they increaſe from above downwards, it lies in ſouth latitude. Again, if the degrees of longitude increaſe towards the right, the countries are in eaſt longitude; but if towards the left, they are in weſt longitude.

The principal objects that diverſify the face of the country delineated in the map, ſuch as rivers, mountains, foreſts lakes, roads, cities, towns, forts, &c. are marked in ſuch a manner as that they may be moſt eaſily diſtinguiſhed. A river is denoted by a black crooked line, drawn very fine towards the ſource or head of the river, and gradually becoming broader as it approaches towards the mouth; and the leſſer rivers or rivulets, which unite their waters with thoſe of their principal ſtream, are denoted by ſimilar lines appearing to branch off from the firſt.

Mountains are repreſented by the figures of little hills; and if theſe figures are placed in a row, they denote a ridge of mountains running acroſs the land. If a mountain is a volcano, it is denoted in the map by the appearance of ſmoke iſſuing from its ſummit. Woods or foreſts are repreſented by a number of little trees or ſhrubs, placed in a group. Lakes are denoted by a circumſcribed ſpot ſhaded with dark lines and bays or fens by a more regular ſpot of the ſame kind, more lightly ſhaded, or, where the map is coloured, painted of a light green. Roads are repreſented in a map by two ſtraight lines drawn parallel to each other, for the principal roads, or by a ſingle ſtraight line for the leſſer or croſs roads. Cities are denoted by a large houſe, or the figure of a church with the ſteeple in the middle; and if the city is the metropolis of the country, this is denoted by a white circular ſpace in the middle of the houſe or church. Small towns are uſually repreſented by circles; and where a ſmall church with the ſteeple at one end occurs, it denotes a pariſh. Where the map is on a large ſcale, or repreſents only a ſmall diſtrict, the towns are denoted by a group of ſmall houſes, or more commonly by a number of ſmall ſhaded ſpots on each ſide of the road. A fort, caſtle, or fortified town, is denoted by a ſemicircular ſpace ſurrounded by an angular edge repreſenting baſtions. The ſhoals upon the coaſt are repreſented by ſmall dots; the depth of water in bays and harbours by figures, denoting the number of fathoms, among which is ſometimes drawn the figure of an anchor, to ſhew that in that place there is good anchorage for ſhips.

The boundaries or limits that divide countries from each other are diſtinguiſhed in maps by dotted lines drawn round each country or diſtrict, in ſuch a direction as to ſhew its proper form. Where the map is coloured, the countries or diſtricts are diſtinguiſhed from each other by the ſide of the boundary next each being ſhaded by a different colour from that of the adjoining. Thus, in a map of Europe the boundary of France may be ſhaded green, that of Spain red, that of Italy yellow, that of Germany blue, &c. In one corner of the map there is uſually drawn a ſcale divided into a number of equal parts, by which the number of miles or leagues from one part of the map to another may be meaſured. Sometimes the parts into which the ſcale is divided are uſed to denote geographical miles, of 60 to a degree; but more commonly they correſpond to the miles in uſe in the country where the map is made, as, in Britain, to Britiſh ſtatute miles of 69¾ to a degree.

To mark more diſtinctly the bearings of different parts of the map, there is uſually added in ſome blank ſpace a circle with four radii, marking the four cardinal points of the compaſs; the north point being diſtinguiſhed by the figure of a *fleur de lis*, and the eaſt point by a croſs.

Till of late, the only diſtinction between the land and water in maps and charts, was afforded by the ſhading of the ſea-coaſt, as mentioned above. In this way, however, the eye cannot eaſily and expeditiouſly diſtinguiſh the form and extent of the land; and, where the ſhading is carried much beyond the boundary of the coaſt, as is often done, eſpecially in engraving ſmall iſlands, the land is made to appear much larger than it really is.

The ingenious Mr Wilſon Lowry having lately contrived an inſtrument for engraving parallel ſtraight lines, in a much more clear and commodious way than

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than could be done by the common graver, it occurred to Mr Pinkerton, while preparing his Modern Geography, that this invention might be applied with advantage to the improvement of maps. A ſet of maps was accordingly engraved by Mr Lowry for Pinkerton's Geography, in which the water was marked by dark parallel lines to diſcriminate it from the land. Theſe lines are drawn horizontally; and Mr Pinkerton propoſed that, in engraving charts, the land ſhould be marked with ſimilar lines drawn in a perpendicular direction, while the water ſhould be left blank. This improvement has ſince been adopted by other conſtructors of maps and charts, and bids fair to be generally uſed. The effect is pleaſing; and the progreſs of inſtruction will be greatly facilitated by the new method, as the extent and bearings of the ſeveral countries are ſeen, as it were, with a glance of the eye. In many of theſe maps which we have ſeen, however, the lines are drawn too ſtrongly, which renders the ſea ſo dark, that the names of iſlands and places on the ſea coaſt can with difficulty be peruſed. As the line of coaſt in theſe maps is ſtrongly marked, the parallel lines denoting the ſea ſhould be engraved in a light and ſoft ſtyle; and in this way Mr Lowry's firſt ſpecimens are executed.

SECT. II. *Of the Conſtruction of Maps and Charts.*

116 Conſtruction of maps.

The conſtruction of maps conſiſts in making a projection of the ſurface of the globe on the plane of ſome one of its circles, ſuppoſing the eye to be placed in ſome particular point. The deſcribing of theſe projections depends on the principles of perſpective, and the projection of the ſphere. The general principles will be explained under thoſe articles, but the particular mode of drawing maps properly forms a part of the preſent treatiſe.

The methods of conſtructing maps vary according to the ſize or ſcale of the map, and to the projection employed in conſtructing it.

117 Orthographic projections.

There are three projections employed in conſtructing maps, the *orthographic*, the *ſtereographic*, and the *globular*. In the orthographic projection the eye is ſuppoſed to view the part of the globe to be projected, from an infinite diſtance. In this projection the parts about the middle of the map are very well repreſented, but thoſe towards the margin are too much contracted.

118 Stereographic projections.

In the ſtereographic projection, the eye is ſuppoſed to be ſituated in the ſurface of the globe to be repreſented, and looking towards the oppoſite ſurface. This is the method uſually employed in conſtructing moſt maps, eſpecially maps of the world, or planiſpheres.

In conſtructing a map of the world, as well as moſt partial maps, the part of the ſphere to be repreſented is ſuppoſed to be in the poſition of a right ſphere (ſee N° 90.). In this mode of projection, the hemiſphere to be repreſented is ſuppoſed to be delineated on the plane of that meridian by which it is bounded, in the ſame manner as its concave ſurface, conceiving the ſphere to be tranſparent, would appear to an eye placed in the oppoſite hemiſphere, where the equator croſſes a meridian; that is 90° diſtant from that which forms the plane of the projection. In a delineation of this kind, the meridians and parallels of latitude are repreſented by arches of circles, except the equator and the central meridian, which are ſtraight lines; and each parallel or meridian forms an arc of a greater circle, in proportion as it approaches nearer to the centre of the map.

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By either of theſe projections only half the globe can be repreſented in one projection; but in the map of the world, the two hemiſpheres are uſually drawn on the plane of the ſame circle, adjacent to each other. By Mercator's projection, uſually employed for charts, and to be deſcribed preſently, the whole globe may be repreſented in one projection, but much diſtorted.

If the projection of a map of the world be formed on the plane of a meridian, the two projections will repreſent the eaſtern and weſtern hemiſpheres of the globe.

When the projection is made on the plane of the equator, in the ſituation of a parallel ſphere, the projections repreſent the northern and ſouthern hemiſpheres, which appear as their concave ſurface would be ſeen by an eye placed at the oppoſite pole. In this way the meridians become ſtraight lines diverging from the ſame centre, and the parallels are circles having the ſame common centre.

The following is the method of conſtructing a map of the world, on the plane of a meridian, according to the globular projection. (See fig. 17.).

119 Globular projection of a map of the world.

About the centre C, with any radius as CB, deſcribe a circle, repreſenting the meridian that is to form the plane of the hemiſphere. Draw the diameters NS, and AB, croſſing each other at right angles, and the former of theſe will be the central meridian, and the latter the equator. Divide each ſemidiameter into nine equal parts, and divide each quadrant of the circle alſo into nine equal parts, each of which will be equal to 11°. If the ſcale of the map be ſufficiently large, each of theſe may again be divided into ten equal parts or degrees. The next object is to deſcribe the meridians paſſing through every 10° of the equator. Suppoſe we are to draw the meridian of 80° weſt of Greenwich. We have here three points given, the two poles and the point 80° on the equator, and it is eaſy to deſcribe a circle that ſhall paſs through theſe three points. This arch will be the meridian. The method of drawing a circle through any three points is, in this caſe, as follows: About the centre S, with the radius SC, deſcribe a circular arch, as XX; and about the centre N, with the ſame radius, deſcribe the arch ZZ; then about the centre 80° with the ſame diſtance, deſcribe arches 1, 1, 2, 2, croſſing the former, and draw lines from 2 to 1 on each ſide of AB, croſſing each other, and AB produced, in D. D is the centre of the circular arc, repreſenting the meridian of 80° weſt from Greenwich; and with the ſame radius the meridian of 140° weſt longitude may be drawn. All the other meridians are to be drawn in a ſimilar manner by deſcribing a circular arch through three points N, S, and the required degree. (See GEOMETRY).

For deſcribing the parallels, ſuppoſe that of 60° N. Lat.; about the centre O, with any radius, deſcribe the circle FGH, and about the points 60°, 60°, in the primitive circle, with the ſame diſtance, deſcribe the arcs *cc*, *dd*, cutting the circle FGH: through the points of interſection draw ſtraight lines, and the point where theſe lines meet in NS produced, as in I, is the centre of the arch that will repreſent the parallel of 60°. The other parallels are drawn in a ſimilar manner, obſerving that the firſt circle, ſuch as FGH, muſt have for its centre that point in the central meridian through which the parallel is to be drawn. Fig. 18. repreſents this

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projection with all the meridians and parallels completed.

If the map is very large, and the paper on which it is to be drawn does not admit of ſo many circles, the centres of the meridians and parallels are more eaſily found in the following manner. Having divided the ſemi-diameters and quadrants, each into 9 equal parts, find, from a ſcale of equal parts, the length of the half chord of each arc, and the verſed ſine of half the ſame arc; then add together the ſquare of the half chord, and the ſquare of the verſed ſine, and divide the ſum by the verſed ſine; the quotient is equal to the diameter, and $\frac{1}{2}$ of this to the radius of the circle required. In this manner the radii of all the meridians and parallels may be found.

As, in drawing maps on a large ſcale, compaſſes of an ordinary ſize will not anſwer for deſcribing the circular arcs, it is convenient to have ſome other mechanical contrivance for this purpoſe; and it is found that a thin flexible ruler of tough wood, called a *bow*, may be ſo bended as to form a curve, very nearly circular, that will paſs through the three points that are to determine the meridian or parallel. In this way the circles on maps on a large ſcale are uſually drawn by engravers and ſtudents of geography; and where the circle is of very large radius, the method is ſufficiently accurate; but it ought by no means to be employed where compaſſes of a proper ſize can be procured, or conveniently uſed.

The following is the method given by Dr Hutton, for deſcribing a globular projection of the earth on the plane of the equator. For the north or ſouth hemiſpheres draw AQBE, for the equinoctial (fig. 19.), dividing it into the four quadrants EA, AQ, QB, and BE; and each quadrant into 9 equal parts, repreſenting each 10° of longitude; and then from the points of diviſion, draw lines to the centre C, for the circles of longitude. Divide any circle of longitude, as the firſt meridian EC, into 9 equal parts, and through theſe points deſcribe circles from the centre C, for the parallels of latitude, numbering them as in the figure. In this method equal ſpaces on the earth are repreſented by equal ſpaces on the map, as nearly as any projection will bear; for a ſpherical ſurface can in no way be repreſented exactly upon a plane. Then the ſeveral countries of the world, ſeas, iſlands, ſea-coaſts, towns, &c. are to be entered in the map, according to their latitudes and longitudes.

To draw a Map of any particular Country.

120 Conſtruction of particular maps.

There are three methods of doing this.

1ſt, For this purpoſe its extent muſt be known as to latitude and longitude; as ſuppoſe Spain, lying between the north latitudes 36° and 44°, and extending from 10° to 23° of longitude, ſo that its extent from north to ſouth is 8°, and from eaſt to weſt 13°.

Draw the line AB for a meridian paſſing through the middle of the country (fig. 20.), on which ſet off 8° from B to A, taken from any convenient ſcale; A being the north and B the ſouth point. Through A and B draw the perpendiculars CD, EF, for the extreme parallels of latitude. Divide AB into eight parts, or degrees, through which draw the other parallels of latitude parallel to the former.

For the meridians, divide any degree in AB into 60 equal parts, or geographical miles. Then, becauſe the length in each parallel decreaſes towards the pole, from the table ſhewing this decreaſe given in p. 514. take the number of miles anſwering to the latitude of B, which is 48½ nearly, and ſet it from B, ſeven times to E, and ſix times to F; ſo is EF divided into degrees. Again, from the ſame table take the number of miles of a degree in the latitude A, viz. 43⅓ nearly; which ſet off from A, ſeven times to C, and ſix times to D. Then from the points of diviſion in the line CD, to the correſponding points in the line EF, draw ſo many right lines for the meridians. Number the degrees of latitude up both ſides of the map, and the degrees of longitude on the top and bottom. Alſo in ſome vacant place make a ſcale of miles, or of degrees, if the map repreſent a large part of the earth; to ſerve for finding the diſtances of places upon the map.

Then make the proper diviſions and ſubdiviſions of the country; and having the latitudes and longitudes of the principal places, it will be eaſy to ſet them down in the map; for any town, &c. muſt be placed where the circles of its latitude and longitude interſect. For inſtance, Gibraltar, whoſe latitude is 36° 11′, and longitude 12° 27′, will be at G; and Madrid, whoſe latitude is 40° 10′, and longitude 14° 44′, will be at M. In the ſame manner the mouth of a river may be ſet down; but to deſcribe the whole courſe of the river, the latitude and longitude of every turning, and of the towns and bridges by which it paſſes, muſt alſo be marked down. The ſame is neceſſary for woods, foreſts, mountains, lakes, caſtles, &c. The boundaries are deſcribed by ſetting down the remarkable places on the ſea coaſt, and drawing a continued line through them all. This method is very proper for ſmall countries.

2d *Method.* Maps of particular places are but portions of the globe, and may therefore be drawn in the ſame manner as the whole globe, either by the orthographic or ſtereographic projection of the ſphere. But in partial maps a more eaſy method is as follows. Having drawn the meridian AB in the laſt figure, and divided it into equal parts as before, draw lines through all the points of diviſion; put them together to AB, to repreſent the parallels of latitude. Then to divide theſe, ſet off the degrees in each parallel; diminiſh after the manner directed for the two extreme parallels CD and EF, and through all the correſponding points draw the meridians, which will be curved lines; theſe were right lines in the laſt method, becauſe only the extreme parallels were divided according to the table. This method is proper for a large tract, as Europe, &c. in which caſe the parallels and meridians need be drawn only through every 5° or 10°. This method is much uſed in drawing maps, as all the parts are nearly of their due magnitude, except being a little diſtorted towards the outſide, from the oblique interſection of the meridians and parallels.

3d *Method.* Draw PB of a convenient length, for a meridian; divide it into nine equal parts, and through the points of diviſion, deſcribe as many circles for the parallels of latitude, from the centre P, which repreſents the pole. Suppoſe AB (fig. 21.) the height of the map; then CD will be the parallel paſſing through the greateſt latitude, and EF will repreſent the equator. Divide the equator EF into 9 equal parts of the ſame ſize as thoſe in AB, both ways beginning AB; divide

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divide alſo all the parallels into the ſame number of equal parts, but leſſer, in proportion to the numbers for the ſeveral latitudes, as directed in the laſt method for the rectilineal parallels. Then through all the correſponding diviſions draw curved lines which will repreſent the meridians, the extreme meridians being EC and FD. Laſtly, number the degrees of latitude and longitude, and place a ſcale of equal parts, either in miles or degrees, for meaſuring diſtances.

When the place of which a map is to be made is but ſmall, as when a county is to be delineated, the meridians will be ſo nearly parallel to one another, and the whole will differ ſo little from a plane, that the map may be laid down in a much more eaſy manner than what is given above. It will be here ſufficient to meaſure the diſtances of places in miles, and note them down in a plane rectangular manner. The method of delineating ſuch partial maps is the province of the ſurveyor. See SURVEYING.

121 Mercator's projection.

Mercator's projection is chiefly confined to charts for the purpoſes of navigation. In this projection the meridians, parallels, and rhumbs, are all ſtraight lines; but inſtead of the degrees of longitude being everywhere equal to thoſe of latitude, as is the caſe in plain charts, the degrees of latitude are increaſed as we approach towards either pole, being made to thoſe of longitude in the proportion of radius to the ſine of the diſtance from the pole, or coſine of the latitude, or, what is the ſame thing, in the ratio of the ſecant of the latitude to radius. Hence all the parallel circles are repreſented by equal and parallel ſtraight lines, and all the meridians are parallel lines alſo; but theſe increaſe indefinitely towards the poles.

From this proportional increaſe of the degrees of the meridian, it is evident that the length of an arc of the meridian beginning at the equator is proportional to the ſum of all the ſecants of the latitude; or that the increaſed meridian bears the ſame proportion to its true arc as the ſum of all the ſecants of the latitude to as many times the radius. The increaſed meridian is alſo analogous to a ſcale of the logarithmic tangents, though this is not at firſt very evident. It is not certain by whom this analogy was firſt diſcovered, but the diſcovery appears to have been made by accident. It was firſt publiſhed and introduced into the practice of navigation by Mr Henry Bond, by whom this property is mentioned in an edition of Norwood's Epitome of Navigation, printed about 1645. This analogy, though it had been found true by actual meaſurement, was not accurately demonſtrated. Nicholas Mercator offered to diſcloſe, for a ſum of money, a method which he had diſcovered for demonſtrating it; but this was not accepted, and the demonſtration was, we believe, never diſcloſed. See *Nicholas* MERCATOR. About two years after, however, the demonſtration was again diſcovered, and publiſhed by James Gregory.

The meridian line in Mercator's ſcale is a ſcale of logarithmic tangents of the half colatitudes. The differences of longitude on any rhumb, are the logarithms of the ſame tangents, but of a different ſpecies; thoſe ſpecies being to each other as the tangents of the angles made with the meridian. Hence any ſcale of logarithmic tangents is a table of the differences of longitude, to ſeveral latitudes, upon ſome one determinate rhumb; and therefore as the tangent of the angle of ſuch a rhumb is to the tangent of any other rhumb, ſo is the difference of the logarithms of any two tangents, to the difference of longitude on the propoſed rhumb, intercepted between the two latitudes, of whoſe half complements the logarithmic tangents were taken.

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It was the great ſtudy of our predeceſſors to contrive ſuch a chart in plano, with ſtraight lines, on which all or any parts of the world might be truly ſet down, according to their longitudes and latitudes, bearings, and diſtances. A method for this purpoſe was hinted at by Ptolemy, near 2000 years ſince, and a general map in ſuch an idea, was made by Mercator: but the principles were not demonſtrated, and a ready way ſhown of deſcribing the chart, till Wright explained how to enlarge the meridian line by the continual addition of ſecants, ſo that all degrees of longitude might be proportional to thoſe of latitude, as on the globe; which renders this chart, in ſeveral reſpects, far more convenient for the navigator's uſe, than the globe itſelf, and which will truly ſhew the courſe and diſtance from place to place, in all caſes of ſailing.

For further particulars reſpecting the conſtruction, and for the uſe of charts, ſee NAVIGATION.

In chooſing maps, it is proper to examine particularly whether the curved lines of thoſe that ought to have the meridians and parallels arches of circles be truly circular. If the map is compoſed of more than one ſheet, the ſheets ſhould be ſo joined together as that the correſponding meridional lines and parallels be each in one continued line. The colours in painted maps, as was obſerved with reſpect to globes, ſhould be fine and tranſparent, and not laid on too thickly.

Maps folded for the pocket anſwer very well for travelling, in ſo far as they point out the relative ſituation of places; but owing to the intervals at which the parts are paſted on the canvas, the diſtances between places cannot be aſcertained with any degree of accuracy.

SECT. III. *Of the uſe of Maps.*

Maps are of great utility in the ſtudy of geography and hiſtory; and if they are accurately drawn, many of the problems that are uſually performed on the globes, may be ſolved mechanically by means of maps.

In conſulting a map, it is not ſufficient to find out in it the name of the place of which you deſire to know the ſituation, although this is frequently all at which the conſulter of a map aims: it is, beſides, proper for the ſtudent to inform himſelf reſpecting the relative poſition of the place, with regard to its vicinity to other places; its bearings and diſtance from the principal places in the ſame or neighbouring diſtricts; whether it is near the ſea-ſhore, and is near a convenient harbour; whether it be ſeated on ſome principal river, and on what ſide of the river; whether it is in the neighbourhood of a conſiderable canal; whether it be near a lake, mountain, foreſt, &c. and many other little particulars that will readily ſuggeſt themſelves to an attentive reader.

The problems that are uſually performed by means of maps, are the following.

PROBLEM I. *To find the latitude and longitude of any given place.*

122 Uſe of maps.

In maps on a large ſcale, or where the meridians and parallels of latitude are ſtraight lines, the latitude of the place

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place may be eaſily found by ſtretching a thread over the place, ſo that it may croſs the ſame degree of latitude on each ſide of the map; and the degree croſſed will be the latitude required. Or, with a pair of compaſſes meaſure the ſhorteſt diſtance of the place from the neareſt parallel, and apply this diſtance to either ſide of the map, ſo as to keep one point of the compaſſes on the ſame parallel; then the other point will ſhew the degree of latitude as meaſured on the graduated margin, counting from the parallel north or ſouth, according as the place is in north or ſouth latitude.

The longitude of the place may be found in a ſimilar manner, by ſtretching the thread over the place, or laying a ruler acroſs it, ſo as to cut the ſame degree of longitude on the top and bottom of the map, and that is the degree required.

The above methods anſwer very well in plain charts or in maps of counties; but when the meridians and parallels are curved lines, we muſt find how often the diſtance of the place, meaſured by the compaſſes from the neareſt parallel, will reach the next parallel in a ſtraight direction, and from thence the latitude may be found with ſufficient exactneſs. Thus, ſuppoſe we are required to find the latitude of Berlin, the capital of Pruſſia. The neareſt parallel is that of 50° north latitude; the diſtance of Berlin from this parallel will reach the parallel of 60° in four times, meaſuring on the map of Europe. The fourth part of ten, or two and a half, added to 50, gives the latitude required, or 52½.

To find the longitude on ſuch maps, meaſure how often the diſtance of the place from the neareſt meridian will reach the next meridian. Thus, in the ſame inſtance, the diſtance of Berlin from the meridian of 10, which is the neareſt towards the eaſt, taken three times, will extend a little beyond the meridian of 20. Add to 10 the third part of this diſtance, which is about three and a half, and we have 13° 30′ for the longitude of Berlin eaſt from London.

PROBLEM II. *The latitude and longitude of a place being given; to find the place on the map.*

Where the meridians and parallels are ſtraight lines, this is done by ſtretching one thread from the given latitude on one ſide of the map to the ſame latitude on the other ſide; while another thread is ſtretched between the correſponding degrees of longitude. The interſecting point of the two threads ſhews the place required. Thus, ſuppoſe we are required to find the place whoſe latitude is 34° 29′ S. and longitude 18° 23′ E. Stretching one thread between the given latitudes, and another between the given longitudes, we ſhall find that they croſs over the Cape of Good Hope, which is therefore the place required.

When the meridians and parallels are curved lines, the moſt accurate way will be to deſcribe a circle of latitude through the given degree of latitude on each ſide, and a circle of longitude through the correſponding degrees of longitude, and the interſection of theſe circles will ſhew the place. An eaſier method will be, knowing between what two parallels of latitude and longitude the place lies, and conſequently by what four lines it is bounded, to find the place by trial, by conſidering the proportional diſtance of it from each line.

PROBLEM III. *The latitude of a place being given; to find all thoſe places on the ſame map that have the ſame latitude.* Principles and Practice.

If a parallel of latitude happen to be drawn on the map through the given place, this problem is eaſily ſolved, by tracing along the parallel, and ſeeing what other places it paſſes through. If a parallel is not drawn through the given place, take with a pair of compaſſes the diſtance of the place from the neareſt parallel; then keeping one foot on the parallel, and the other in ſuch a poſition as to deſcribe a line parallel to the parallel of latitude, move the compaſſes, and all the places over which the point that is not on the parallel paſſes, have the ſame latitude with the given place.

This method will not ſucceed in maps on which large tract of country is delineated on a ſmall ſcale.

PROBLEM IV. *Given the longitude of a place; to find on the map all thoſe places that have the ſame longitude.*

Find the longitude of the given place, and if a meridian paſſes through it, obſerve all the places that lie under this meridian; or, if a meridian does not paſs through the place, find by the compaſſes, as in the laſt problem, thoſe places that are ſituated at the ſame parallel diſtance with the given place from the neareſt meridian. Theſe places have nearly the ſame longitude with the given place.

PROBLEM V. *To find the antœci of a given place.*

Find the latitude and longitude of the place by Problem I. and find another place of the ſame longitude, whoſe latitude is equal to that of the former, but in a contrary direction. The inhabitants of this latter place are the antœci to the latter.

Ex. Suppoſe a ſhip to be in the Indian ocean, in lat. 13° S. and long. 80° E. it is required to find the antœci to her preſent ſituation? *Anſ.* The place which has nearly the ſame longitude, and an equal latitude in a contrary direction, viz. 13° N. is Madras.

PROBLEM VI. *To find the periœci of a given place.*

Find the longitude of the given place, and ſubtract it from 180°: the remainder will be the longitude in an oppoſite direction of the periœci. Then find a place having an equal longitude with this laſt, and having the ſame latitude with that of the given place: this latter is the ſituation required.

Ex. It is required to find the periœci to the inhabitants of the gulf of Siam. *Anſ.* The longitude of Siam is 100° 50′ E. which, ſubtracted from 180°, leaves 79° 10′ W. Now, the place that has this longitude, and the ſame latitude with Siam, viz. about 14° N. is the iſthmus of Darien.

PROBLEM VII. *To find the antipodes of a given place.*

This problem is ſolved on maps in the ſame manner as on the globe.

PROBLEM VIII. *Having the hour at any place given; to find what hour it is in any part of the world.*

Find the difference of longitude between the two places, and reduce this to its equal value in time, by

Principles and Practice.

N° 65. Add this value to the given hour, if the place where the time is required be to the eaſtward of the given place, and the ſum is the time required. If the place at which the time is required lie to the weſtward of the given place, ſubtract the difference of longitude in time from the given hour, and the difference is the time ſought.

Note.—If, after adding, the ſum is found greater than 12, 12 muſt be cancelled, and the hours muſt be changed from A. M. to P. M. and *vice verſa*; and if, on ſubtracting, the difference in time between the two places happens to be greater than the given hour, 12 muſt be added to the given hour, and the hours changed as before mentioned.

Ex. Suppoſe it to be at preſent 9 A. M. at Liſbon, what time of the day is it at Pekin in China? *Anſ.* The difference of longitude between Pekin and Liſbon is 125° 33′, which reduced to time gives 8 hours 22 minutes; and ſince Pekin lies to the eaſt of Liſbon, this muſt be added to 9, the given hour, giving a ſum of 17 hours, 22 minutes; but as this is greater than 12, we muſt take 12 away, and the difference, 5 hours 22 minutes, changed from morning to afternoon hours, is the time required. It is therefore 22 minutes paſt five P. M. at Pekin.

PROBLEM IX. *To find thoſe places in the torrid zone to which the ſun is vertical on any given day.*

Find in an ephemeris, or nautical almanack, the ſun's declination for the given day; then obſerve, in the map of the world, all thoſe places which lie under that parallel of latitude, which is the ſame with the declination, and theſe will be the places required.

Ex. It is required to find at what places the ſun will be vertical on the 20th of March and 23d of September? *Anſ.* The ſun's declination on the 20th of March, is 19′ S. and on the 23d of September 6′ N. Now the principal places that lie near the parallel of 19′ S. and 6′ N. are the iſland of St Thomas, the middle part of the iſlands of Sumatra and Borneo; the Gallipagos iſles, and Quito in South America.

123 Analemma for ſolving geographical problems.

The Analemma, or Orthographic Projection delineated in Plate CCXXXV. will ſolve many of the moſt curious problems, and with the aſſiſtance of maps will be almoſt equivalent to a terreſtrial globe. The parallel lines drawn on this figure repreſent the degrees of the ſun's declination from the equator, whether north or ſouth, amounting to 23½ nearly. On theſe lines are marked the months and days which correſpond to ſuch and ſuch declinations. The ſize of the figure does not admit of having every day of the year inſerted; but by making allowance for the intermediate days, in proportion to the reſt, the declination may be gueſſed at with tolerable exactneſs. The elliptical lines are deſigned to ſhew the hour of ſunriſing or ſunſetting before or after ſix o'clock. As 60 minutes make an hour of time, a fourth part of the ſpace between each of the hour-lines will repreſent 15 minutes; which the eye can readily gueſs at, and which is as great exactneſs as can be expected from any mechanical invention, or as is neceſſary to anſwer any common purpoſe. The circles drawn round the centre at the diſtance of 11¼ each, ſhew the point of the compaſs on which the ſun riſes and ſets, and on what point the twilight begins and ends.

In order to make uſe of this analemma, it is only neceſſary to conſider, that, when the latitude of the place and the ſun's declination are both north or both ſouth, the ſun riſes before ſix o'clock, between the eaſt and the elevated pole; that is, towards the north, if the latitude and declination are north; or towards the ſouth, if the latitude and declination are ſouth. Let us now ſuppoſe it is required to find the time of the ſun's riſing and ſetting, the length of the days and nights, the time when the twilight begins and ends, and what point of the horizen the ſun riſes and ſets on, for the Lizard point in England, Frankfort in Germany, or Abbeville in France, on the 30th of April. The latitude of theſe places by the maps will be found nearly 50° N. Place the moveable index ſo that its point may touch 50° on the quadrant of north latitude in the figure; then obſerve where its edge cuts the parallel line on which April 30th is written. From this reckon the hour-lines towards the centre, and you will find that the parallel line is cut by the index nearly at the diſtance of one hour and 15 minutes. So the ſun riſes at one hour 15 minutes before ſix, or 45 minuets after four in the morning, and ſets 15 minutes after ſeven in the evening. The length of the day is 14 hours 30 minutes. Obſerve how far the interſection of the edge of the index with the parallel of April 30th is diſtant from any of the concentric circles, which you will find to be a little beyond that marked two points of the compaſs, and this ſhews that on the 30th of April the ſun riſes two points and ſomewhat more from the eaſt towards the north, or a little to the northward of eaſt-north-eaſt, and ſets a little to the northward of weſt-north-weſt. To find the beginning and ending of the twilight, take from the graduated arch of the circle 17½ degrees with a pair of compaſſes; move one foot of the compaſſes extended to this diſtance along the parallel of April 30th, till the other juſt touches the edge of the index, which muſt ſtill point at 50. The place where the other foot reſts on the parallel of April 30th, then denotes the number of hours before ſix at which the twilight begins. This is ſomewhat more than three hours and a half, which ſhews that the twilight then begins ſoon after two in the morning, and likewiſe that it begins to appear near five points from the eaſt towards the north. The uſes of this analemma may be varied in a great number of ways; but the example juſt now given will be ſufficient for the ingenious reader.

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SECT. IV. *Of the Origin and Progreſs of Maps.*

124 Origin of maps.

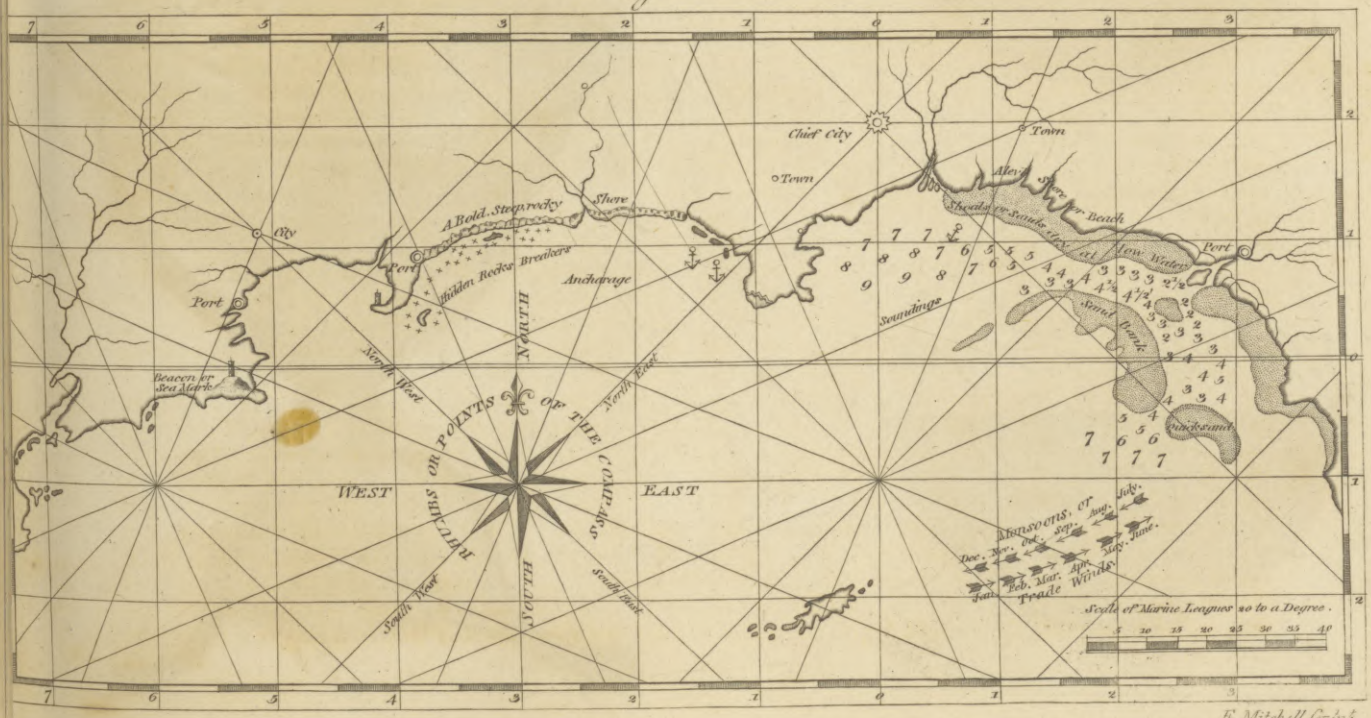
The firſt map of which we have any certain record, is that of Anaximander, about 560 years before the Chriſtian era. This is mentioned by Strabo, book i. and is ſuppoſed to be that referred to by Hipparchus, under the name of the ancient map.

It has been alleged, that Seſoſtris, king of Egypt, on his return from his boaſted expedition, after having traverſed great part of the earth, recorded his march in maps, of which he gave copies, not only to the Egyptians, but to the Scythians, to the great admiration of both people. This is the relation of Euſtathius; but M Montucla conſiders it as a very improbable ſtory, and thinks that the invention of maps cannot be dated prior to Anaximander *. Some have ſuppoſed that the Jews laid down the holy land in a map, when they diſtributed

* *Montucl. Hiſt. de Mathem.* tom. iv. p. 589.

Fig. 1.

Fig. 2.



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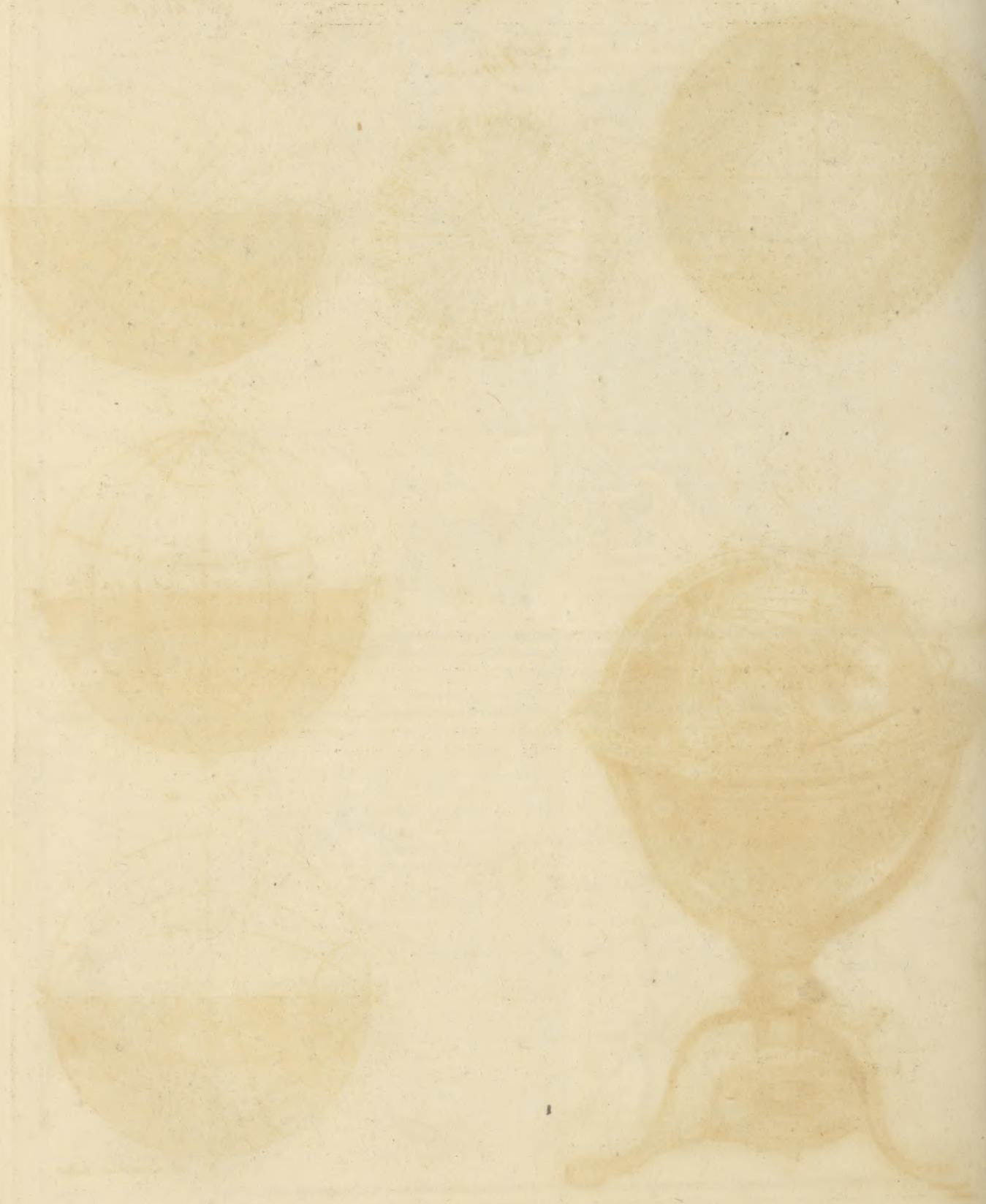


Fig. 3.

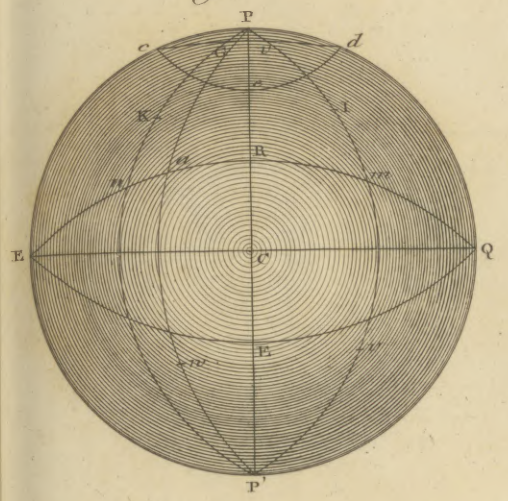


Fig. 4.

Fig. 6.

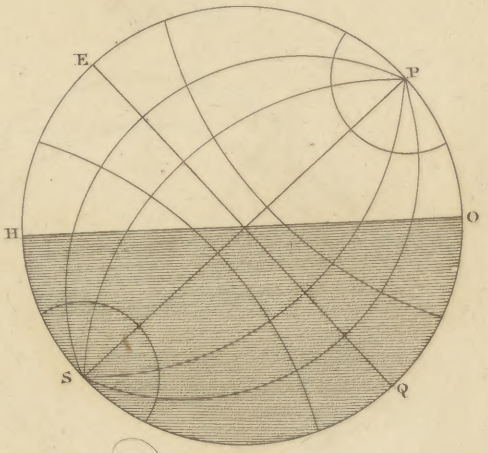


Fig. 5.

Fig. 7.

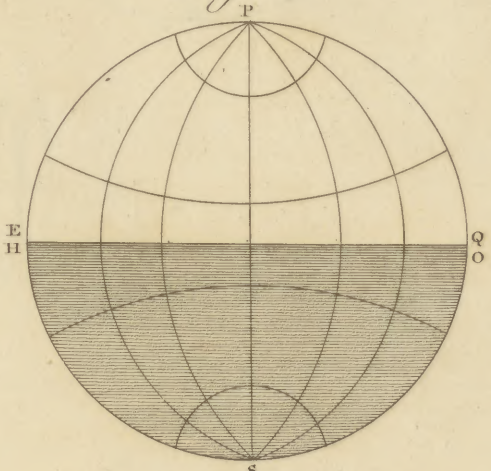
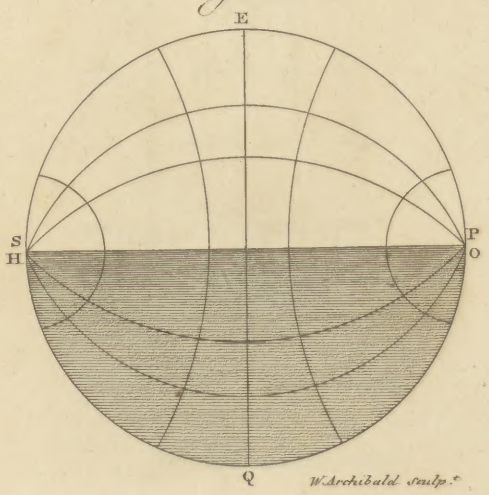


Fig. 8.



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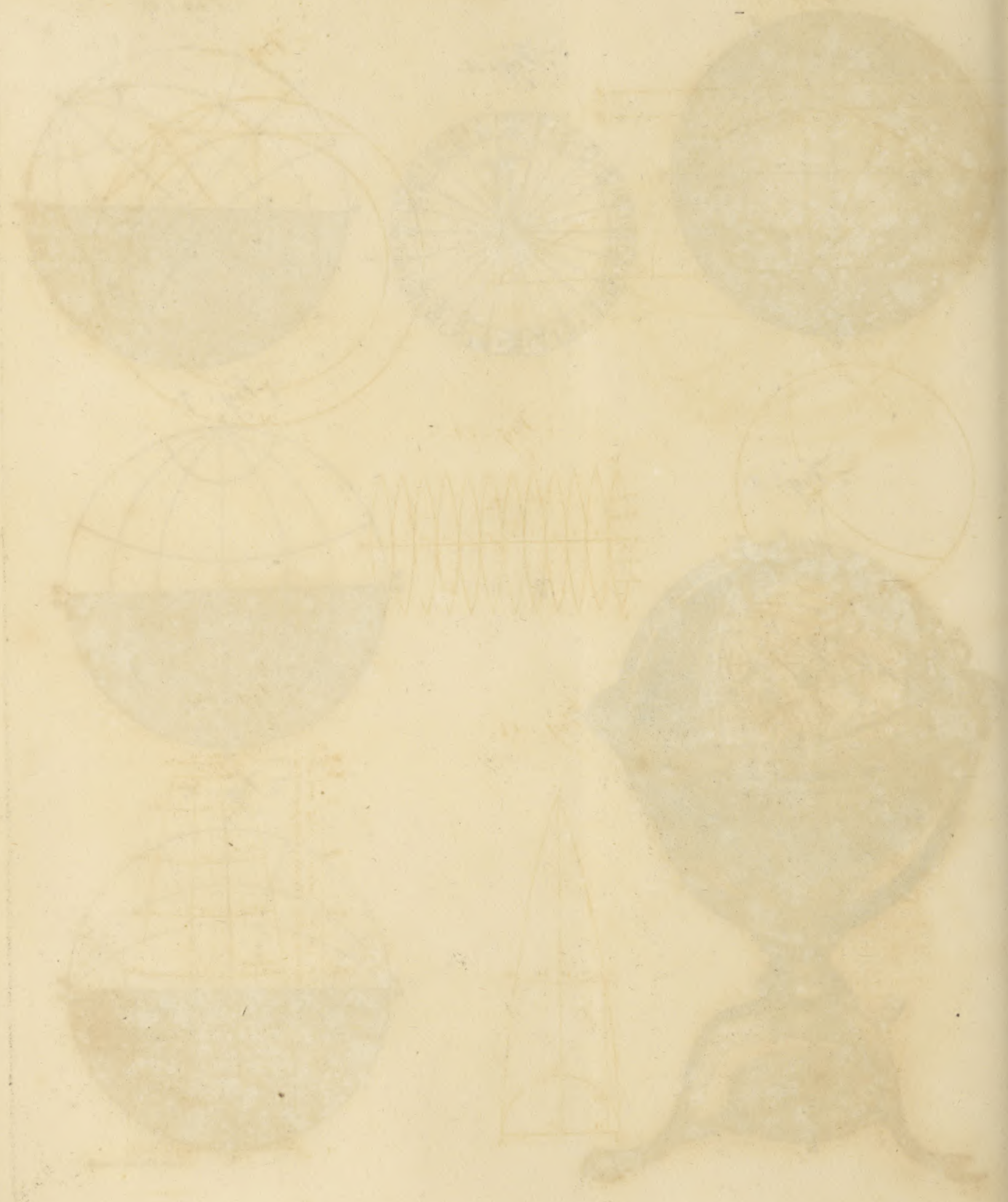
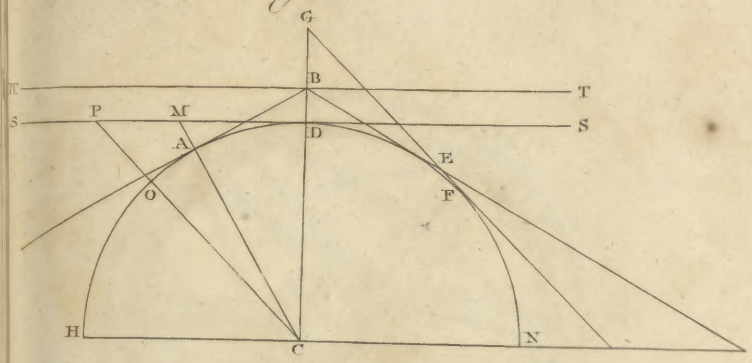


Fig. 9.



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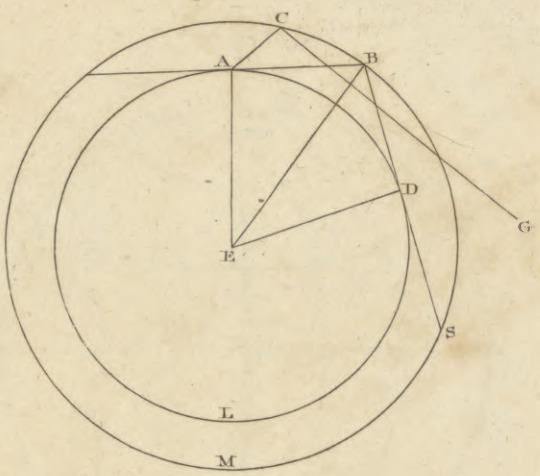

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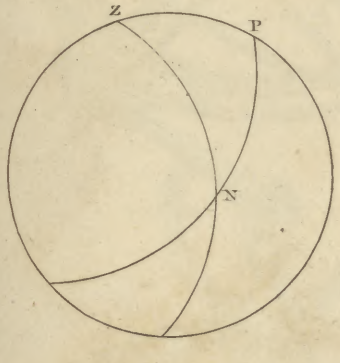

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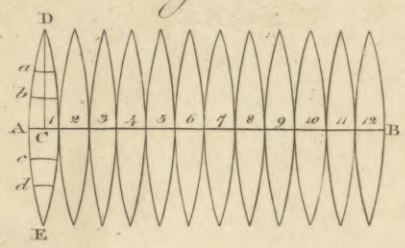
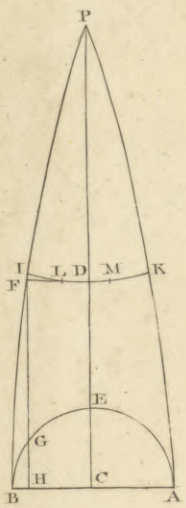


Fig. 13.

Fig. 14.



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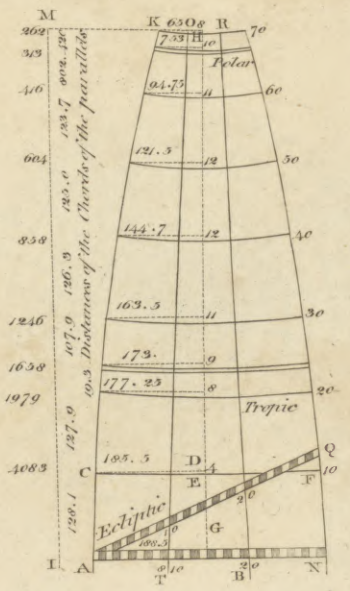

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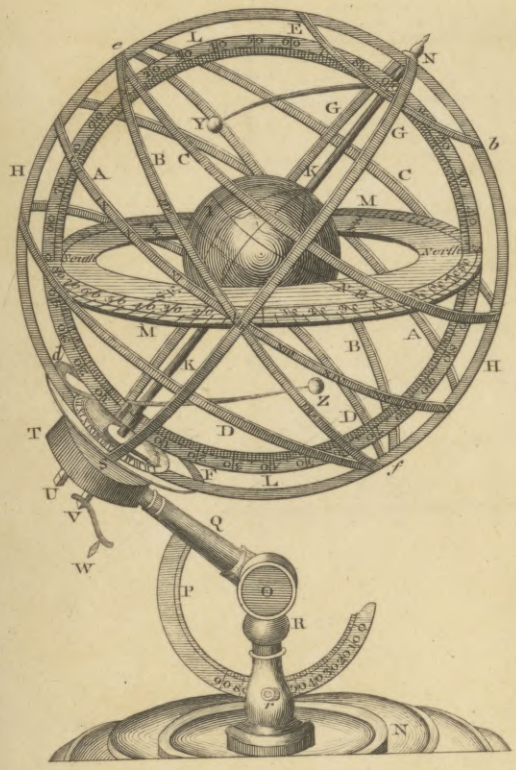
Fig. 16.



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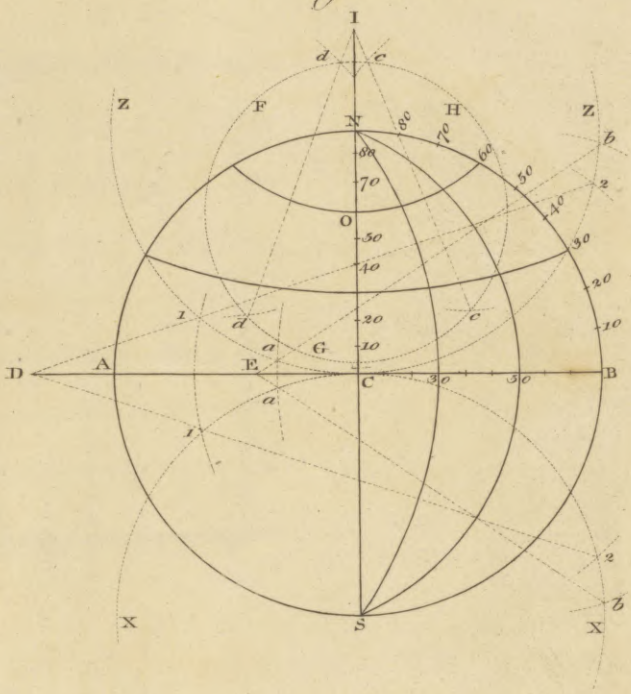

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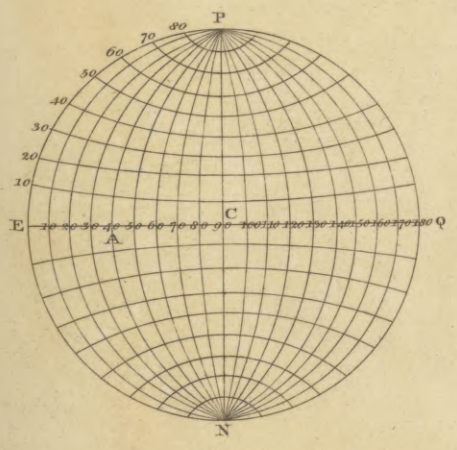
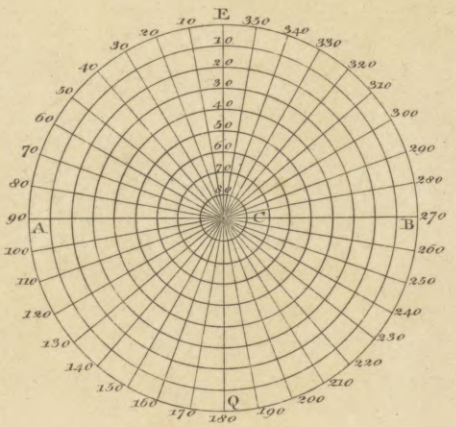


Fig. 19.



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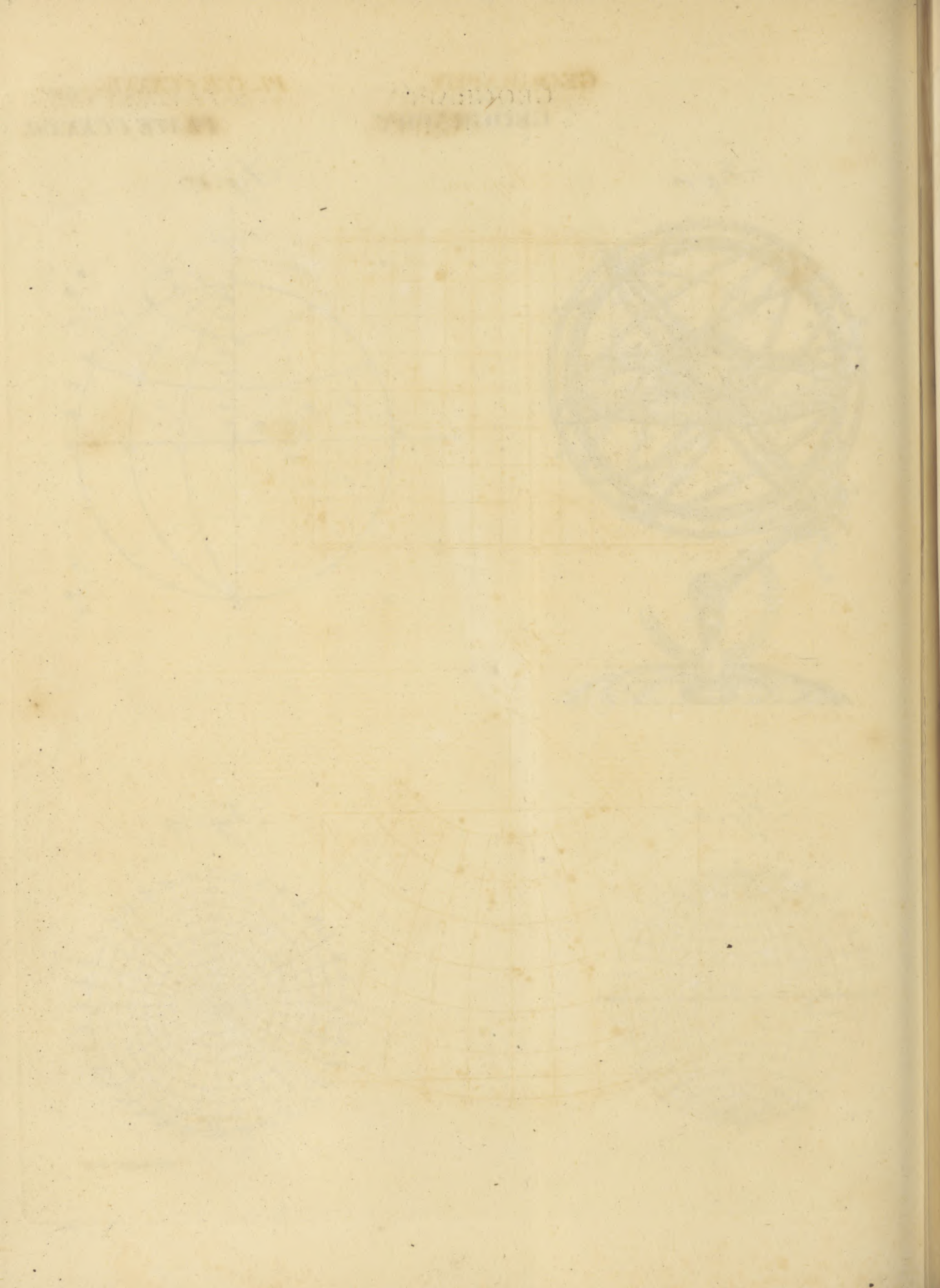
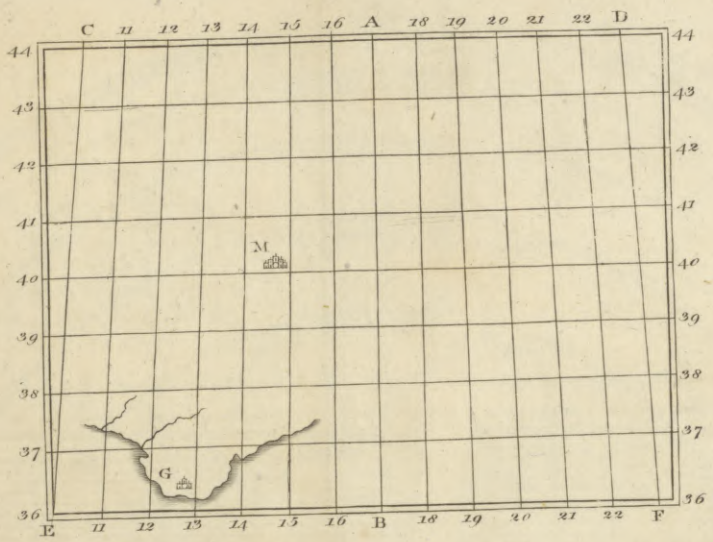


Fig. 20.



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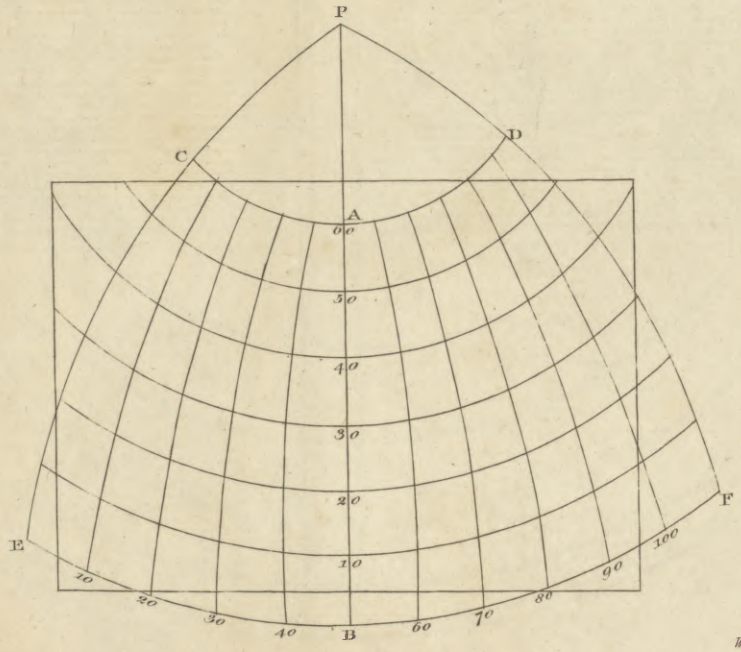

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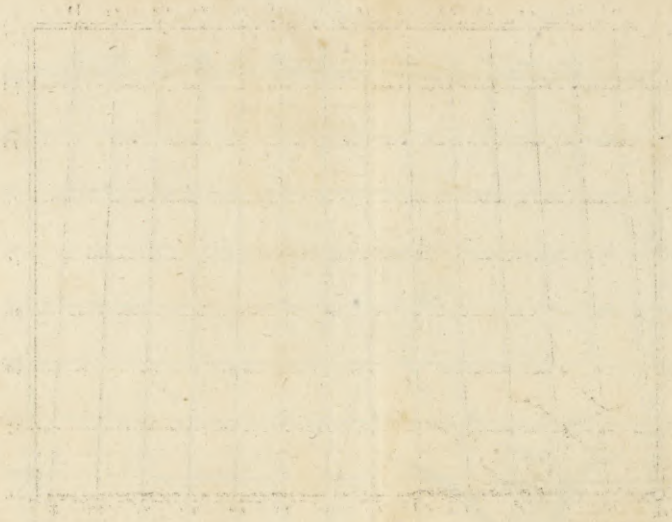

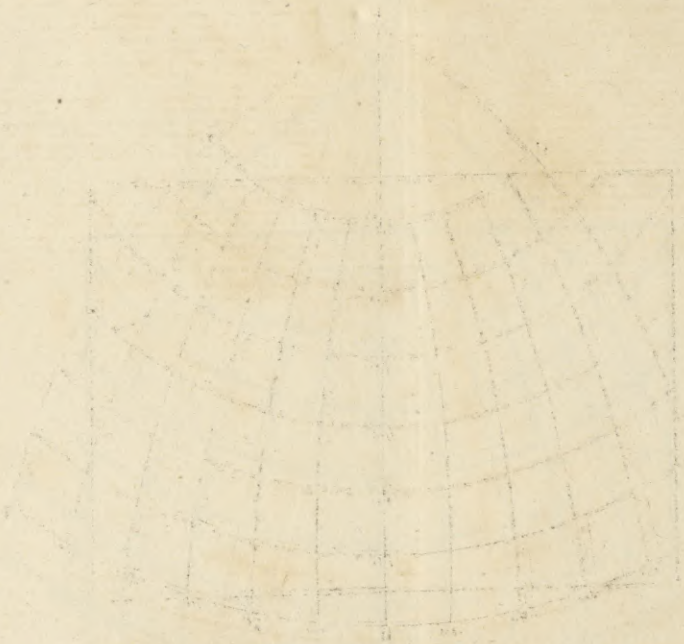

An Analemma, Shewing the time of Sun rising & Sun setting, the length of the Days & Nights, and the point the Compass on which the Sun rises & sets, for every Degree of Latitude, and for every Degree of the Suns North South declination.

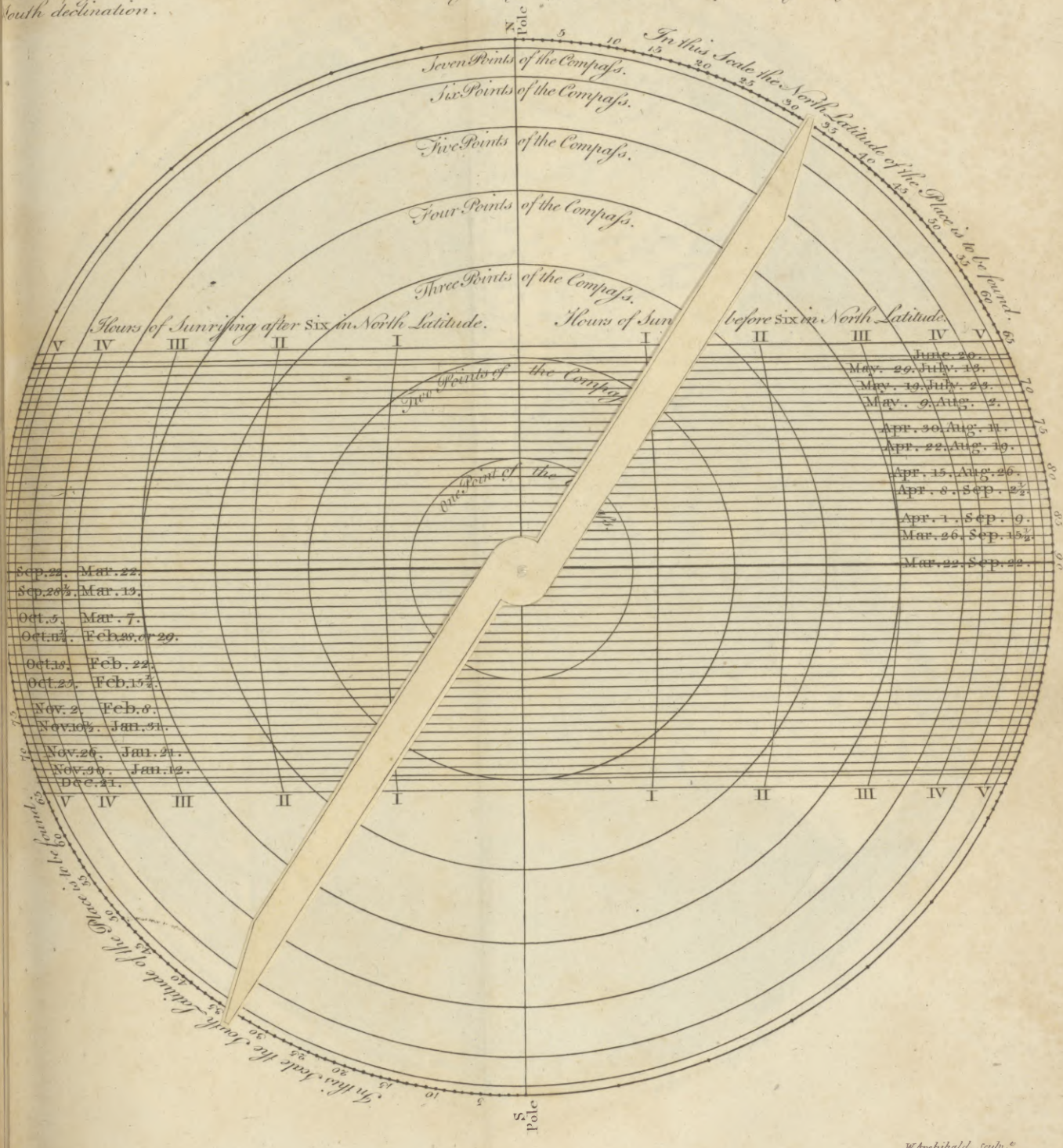

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PLATE CCXXXVI.

THE WORLD

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0
30
270
300
80
60
40
20
0
NORTH
ATLANTIC
OCEAN
SOUTH
ATLANTIC
OCEAN
PART of OLD GREENLAND
SPITSBERGEN
Hinlopen
The 7 Isles
NE Land
Hakluyts Ht I.
Pr. Charles I.
Staats Vorland
Sta. Cape
Hoop I.
Ld Hamkes B.
Bontekoe
Hold with Hope
John Mayens I.
Farm Point
North Cape
Lapland
Sweden
Norway
Iceland
Faroe Isles
Shetland I.
Orkney I.
Ireland
Stockholm
Konigsberg
Russia
Berlin
Amsterdam
Warsaw
Poland
Germany
Paris
Vienna
Presburg
Hungary
France
Switz.
Bay of Biscay
Genoa
Constantinople
Black Sea
Azores
Lisbon
C. St Vincent
Gibraltar
Sardinia
Corsica
Sicily
Malta
Cyprus
Candia
Mediterranean Sea
The Madeiras
Madeira I.
Algier
Barbary
Tripoli
Alexandria
Canaries
Morocco
Tegra Desert
Cogden Desert
Sahara or G. Desert
Kiuku
Cape Verd I.
Tombuctoo
Senegal
Soudan
Ghana
Bornou
Darfur
Senaar
Coast of Guinea
Gold Coast
Popo
Mujaco
Calabongos
Bomba
St Paul's I.
C. Lopez
Anabona
St Matthew
Ascension I.
Loango
Congo
Angola
Benguela
Jagas
Vimeuuni
Pungeno
R. Zahir
R. Conuza
St Helena
C. Negro
Cinibebas
Mocaranga
Boroos
Walwich B.
Sandwich Ht
Angra Pequena
Delagoa Bay
Camdebo Veld
Hottentots
C. Veltas
Table B.
Cape Town
C. of Good Hope
Tristan de Cunha
I. Diego
Cowgh I.
Sasemburg
Sandwich Land
Pr. Edward
Bibi
Inhumbane
Sofala
Tropic of Capricorn
Ld of Capricorn
Baffins Bay
(doubtful)
Sir Jos. Lancaster Sound
Sir T. Smiths Sound
Hakluyts I.
Cape Ld
Hakluyts Ld
Westenholm Sound
Hakluyts Sound
Sanderus Hope
Greenland
London Coast
Hevens Discov.
Davis's Strait
Cape Desolation
Cape Farewel
Land of the Lincolns
Broken Land
Resolution I.
Hudsons Strait
Cape Dudley Digges
Frozen Sea
The Sea
Buddle Lake
Gogood L.
Repulse B.
Dodsland I.
Sandwich Land
The Welcome
New North Wales
Hudsons Bay
Portland I.
Cape Diggs
Eskimaux
Labrador
Cataract
James Bay
Albany
Moose
Michipicoten I.
Lake Superior
Canada
Quebec
Lake Ontario
Lake Michigan
Boston
Cape Cod
Philadelphia
New Foundland
Green I.
Nova Scotia
Louisiana
Mexico
United States
Washington
Newbury
Charleston
C. Hatteras
I. Bermudas
Rocks
Gulf of Mexico
Bahama I.
Havana
Cape Florida
Jamaica
Port Royal
Dominico
Porto Rico
Guadaloupe
Barbadoes
Trinidad
Caribbean Sea
Spanish Main
Gulf of Nicoya
Gulf of Panama
Gallapagos
Gallego I.
Gulf of Guayaquil
Quito
Quixos
Peru
Lima
Truxillo
C. St Nicolas
Arica
Atacama
Guiana
Cayenne
Coast of Guiana
Para
Maranon R.
Amazons R.
Brazil
Tapayos
Rio de la Madre
Villanova
Aracuicon
Rio St Sebastian
Spiritu Santo
Rio
Paraguay
South
St Catherina
Rio St Pedro
Rio de la Plata
Buenos Ayres
Monte Video
Rio de la Plata
C. S. Antonia
Chili
Imperial
I. Chiloe
I. Juan Fernandez
I. Grand
I. Grand
C. de Penas
Pt Deseado
Falkland Is
Magellan
Terra del Fuego
Staten Land
C. Horn
Lof Georgia
Ld of Georgia
Pt Edward
Sandwich Land
The most Southern Latitude of Capt. Cook.

A Chart of THE WORLD on Mercator's Projection

W. Archibald Sculp.

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tributed the different portions to the nine tribes at Shiloh; a ſuppoſition which is derived from Joſhua's account, that they were ſent to walk through the land, and that they deſcribed it in ſeven parts in a book. Joſephus alſo relates, that when Joſhua ſent people from the different tribes to meaſure the land of promiſe, he ſent with them men well ſkilled in geometry. All this, however, is no proof that theſe perſons drew a ſketch of the country, according to our idea of a map; but probably only wrote down, for the ſatisfaction of their employers, the extent, boundaries, and general characteriſtics of the diviſions of the land.

Herodotus has given a minute deſcription of a map conſtructed by Ariſtagoras, tyrant of Miletus, an abridgement of which will ſerve to give ſome notion of the maps of thoſe times. It was drawn upon braſs or copper, and ſeems to have been merely an itinerary containing the route through the countries which were to be traverſed in a march which Ariſtagoras propoſed to Cleomenes, king of Sparta, for the purpoſe of attacking the king of Perſia at Suſa, that he might thus aſſiſt in reſtoring the Ionians to their liberty. The rivers Halis, Euphrates, and Tigris, which, according to Herodotus, muſt have been croſſed in that expedition, were laid down in this map; and it contained one ſtraight line, called the royal road or high way, which comprehended all the ſtations or places of encampment, from Sardis, the beginning of the route, to Suſa, a diſtance of 13,500 ſtadia, or 1687½ Roman miles of 5000 feet each. The number of encampments in this whole route was 111.

Ptolemy of Alexandria, the celebrated geographer mentioned in N° 21. conſtructed maps to illuſtrate his deſcription of places, and theſe are the firſt that have regular meridians and parallels, the better to define and determine the ſituation of places. Ptolemy acknowledges that his maps, with the addition of ſome improvements of his own, the principal of which was certainly the introduction of meridians and parallels, were copied from previous maps made by Marianus Tyrius, &c. They are, however, often very inaccurate.

According to Atheneus, a work which ſeems to have contained maps, was written by Baeton, under the title of Alexander's march; and a work on the ſame ſubject is mentioned as the production of Amynthus. We are informed by Pliny, that this Baeton was one of the ſurveyors of Alexander's marches; and he quotes the exact number of miles of theſe marches, according to Baeton's menſuration, and confirms their authenticity by the letters of Alexander. Pliny alſo remarks, that a copy of this conqueror's ſurveys was given by Zenobius, his treaſurer, to the geographer Patrocles, who was admiral of the fleets of Seleucus and Antiochus.

125 Peutingerian table.

Among the moſt celebrated of the ancient maps, are the Peutingerian tables, ſo called, becauſe publiſhed by Peutinger of Augſburg. Theſe tables contain an itinerary of the whole Roman empire; all places except ſeas, wood, and deſerts, being laid down according to their meaſured diſtances, though without any mention of latitude, longitude, or bearing. A particular deſcription of this monument of antiquity is given in the 18th volume of the Hiſtory of the Academy of Inſcriptions, and in the Hiſtory of the Academy of Sciences for 1761, from which M. Montucla has drawn up the following account. The map of Peutinger, as it is in the original in the imperial library, is exactly one French foot in height, and 20 feet eight inches in length, according to meaſures taken by Buache, from a copy of the ſplendid edition given by Scheele in 1753. It comprehends the whole extent of the Roman empire, from Conſtantinople to the ocean, and from the ſhores of Africa to the northern parts of Gaul; but the table which it affords of this vaſt extent of country is by no means calculated to give us an idea of its figure, ſince the 35° of longitude which it comprehends, occupy 20 feet 8 inches, while the 13° of latitude are compriſed within the ſpace of one foot; thus the countries repreſented are ſo diſfigured, that the Mediterranean appears only like a broad river, and all the countries are ſo diſtorted, towards the north and ſouth, that they cannot be recogniſed.

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Moſt of thoſe who have ſeen this ancient map, have conſidered it as the rude and bungling work of a man little converſant with geography, and ſtill leſs ſo with mathematics; but Edmund Brutz conſiders the diſtortion of this map as ſimilar to what we ſee in ſome pieces of perſpective, and that it ought to be examined from ſome certain near point in order to perceive the objects in their natural proportion.

Buache ſuppoſed long ago, that this map was conſtructed with more ſcientific ſkill than it appears to be at the firſt glance; and that the apparent irregularities which we obſerve in it, might have been introduced deſignedly, for the purpoſe of deriving greater advantages as to what was intended for the principal object. In fact, as the Roman routes extended almoſt entirely from eaſt to weſt, they paid more attention to the meaſures in this direction than thoſe between north and ſouth; and the map in this way might have had the greater convenience of being more eaſily rolled up, and conſequently more portable.

Thus far Buache hazarded no more than conjecture; but a labour undertaken by him with a very different view, led him to the true deſign of the map of Peutinger. He had been tracing a ſcale of climates, and of the length of the days and nights, for the purpoſe of attaching it to ſmall maps of the different countries of Europe. As the ſpace occupied by the ſcale was pretty much extended in height, but had very little breadth, he formed the idea of drawing a kind of map upon two ſcales, one pretty much extended for the latitude, and the other very much contracted for the longitudes, preſerving the hollows of the coaſts and boundaries of each ſtate. As this diſpoſition of his map ſtrangely diſfigured the countries which it was intended to repreſent, he was led to imagine that this map might be the reverſe of that of Peutinger. This was ſufficient to engage him to conſtruct another map upon the ſame principle; but in which the ſcale of longitudes was much greater than that of the latitudes. He then ſaw that he had been right in his ſuppoſition, and that the map which he had laſt conſtructed had a conſiderable reſemblance to that of Peutinger. This latter is in fact only a plain chart, conſtructed upon two ſcales, of which that of the longitudes is very great, and that of the latitudes much ſmaller.

One difficulty alone aroſe. By ſuppoſing that he obſerved in this map a cuſtom at preſent eſtabliſhed among geographers, of repreſenting the meridians by lines drawn perpendicular to the baſe of the chart, and the

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parallels to the equator by ſtraight lines drawn parallel to this ſame baſe, Buache found a conſiderable error. The bottom of the gulf of Venice and Rome did not then appear, as they ought to do, under the ſame meridian. He ſoon, however, ſaw the ſolution of this difficulty. The method of drawing the meridians parallel to the ſides of the chart, is a matter of pure agreement, and had probably not been obſerved in the map of which we are ſpeaking. The ancient Roman geographers having conſidered that Italy was naturally divided by the Appenines, according to its length, into two parts that were nearly equal, had therefore delineated the length of Italy from Trent to the end of the peninſula, parallel to the lower margin of the map, and had afterwards arranged the other parts which the map was to contain, conformably to this diſpoſition; and as the length of Italy is not in a direction parallel to the equator, it would happen neceſſarily that the meridians and parallels, if they had been drawn on this map, would have been parallel neither to the ſides nor to the lower margins of the map, and that the vertical line paſſing through Rome muſt interſect the gulf of Venice at about the middle: but this line is not a meridian.

Thus, this map is not ſo rude a work as has been imagined, but has been entirely conſtructed according to rule; and it even appears that the author had employed pretty good materials in its compilation, as the poſitions are laid down in a manner that differs little from modern obſervation*.

* *M. Montucla*, tom. iv. p. 599.

From the time of Ptolemy till about the 14th century, no new maps were publiſhed; and the firſt maps of any eſteem among the moderns were conſtructed by Mercator, to whom we are indebted for the projection according to which marine charts are conſtructed. Mercator was followed by Ortelius, who undertook to conſtruct a new ſet of maps with the modern diviſions of countries and names of places, for want of which the maps of Ptolemy were become almoſt uſeleſs. After Mercator and Ortelius, many others publiſhed maps, which were chiefly copied from thoſe above mentioned, till about the middle of the 17th century, when Blaeu publiſhed his large atlas, or *Coſmographie blaviane*, in which is a pretty accurate deſcription of the earth, the ſea, and the heavens, compriſed in 12 folio volumes. About the ſame time an atlas in two folio volumes was publiſhed in France by M. Sanſon, the maps of which are in general very correct, containing many improvements of the travellers of thoſe times. The maps of Blaeu and Sanſon were copied with little variation both in England, France, and Holland, till from later obſervations De Liſle, Robert, Wall, &c. publiſhed ſtill more accurate and copious ſets of maps.

The works of recent travellers and navigators have conſiderably improved the conſtruction and accuracy of our maps and charts; but there is ſtill much to be done, eſpecially with reſpect to trigonometrical ſurveys, before any high degree of correctneſs can be acquired. Among the lateſt maps and charts, thoſe conſtructed by Mr Arrowſmith are in the greateſt eſtimation.

126 Catalogue of the beſt maps.

As a collection of good and accurate maps is of the greateſt importance in the ſtudy of geography and hiſtory, we ſhall here ſubjoin a liſt of ſome of the beſt modern maps that have been publiſhed.

Thoſe maps which may be collected for the purpoſe of forming an atlas, have been arranged under three heads, according to their ſize, or the extent of their ſcale. 1ſt, Thoſe which conſiſt of more than ſix ſheets, ſuch as De Bouge's map of Europe in 50 half ſheets, and Caſſini's map of France in 183 ſheets. 2dly, Thoſe from ſix to four ſheets, to which claſs belong ſeveral maps of kingdoms. And, 3dly, Thoſe from one ſheet to four, which is the ſmalleſt ſize that can anſwer the purpoſe of an atlas. We ſhall briefly notice the beſt maps of each ſize.

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Planiſpheres, or *Maps of the World.*—We know of no very large map of the world that can at preſent be confidently relied on: the beſt is that of Mr Arrowſmith in four ſheets; and Faden has publiſhed very good maps in one ſheet.

Maps of Europe.—1ſt Size. That of De Bouge, publiſhed at Vienna, or that by Sortzmann in 16 ſheets, which is the better of the two. 2d Size. Arrowſmith's in four ſheets. 3d Size. That by Faden in one ſheet.

Maps of England.—I. The trigonometrical ſurveys of the counties, publiſhed by Lindley and Gardner, and by Faden. II. Cary's atlas of the counties, and his England and Wales in 81 ſheets. III. Faden's map in one ſheet.

Maps of Wales.—I. That of Evans in nine ſheets. III. The maps in Pennant's Tours, and Evans's Cambrian Itinerary.

Maps of Scotland.—I. The ſurveys of the ſeveral counties. II. Ainſlie's nine ſheet map. III. An excellent map by General Roy, and Ainſlie's reduced map in one ſheet.

Maps of Ireland.—I. Survey of counties. III. A valuable map by Dr Beaufort in two ſheets, or Faden's in one ſheet.

Maps of France.—I. Caſſini's mentioned above, and the *atlas nationale* in 85 ſheets. III. Faden's one ſheet map, and a map, in departments, by Bellycime in four ſheets.

Maps of the Netherlands.—I. Ferran's map in 25 ſheets. II. *Atlas de Department Belgique.* III. Ferrari's map reduced by Faden.

Maps of Holland.—II. Kep's maps of the United Provinces. III. Faden's map of the Seven United Provinces in one ſheet.

Maps of Germany.—II. Chauchard's map of Germany. III. A map of the Auſtrian dominions, in one ſheet, by Baron Lichtenſtern.

Maps of Pruſſia.—I. Sortzmann's atlas in 21 ſheets. III. Sortzmann's reduced, in one ſheet.

Maps of Spain.—Lopez's atlas, not, however, very accurate. II. A map of Spain in nine ſheets by Montelle and Chanlaire. III. Faden's map in one ſheet.

Maps of Portugal.—II. Geoffry's improved by Rainſford, in ſix ſheets. III. De la Rochette's chorographical map in one ſheep, publiſhed by Faden.

Maps of Italy.—I. The maps of the ſeveral ſtates. III. D'Anville's map of Italy improved by De la Rochette, in four ſheets, publiſhed by Faden.

Maps of Turkey in Europe.—III. Arrowſmith's map of Turkey in two ſheets. De la Rochette's map of Greece in one ſheet.

Maps of Switzerland.—I. Weiſs's atlas, publiſhed at Straſburg in 1800. III. Weiſs's reduced map in one ſheet.

Maps of Denmark.—I. Maps of the provinces, under the direction of Bygge. III. Faden's maps of Denmark, Sweden, and Norway, in one ſheet.

Maps

Maps of Sweden.—I. Atlas of the Swediſh provinces, by Baron Hermelin. III. De la Rochette's, by Faden, in one ſheet.

Maps of Aſia.—The beſt general map of Aſia is that by Arrowſmith in four ſheets, publiſhed in 1801; and D'Anville's, in ſix ſheets, may ſtill be conſulted with advantage.

There are few good maps of the individual countries; but the following are eſteemed among the beſt.

Of China.—D'Anville's atlas, and a map by Arrowſmith.

Of Tartary.—A map by Witſen, in ſix ſheets, and one by De Witt in one ſheet.

Of Japan.—Robert's map in one ſheet.

Of the Birman Empire.—The maps publiſhed in Mr Symes's embaſſy.

Of Hindoſtan.—Rennell's map in four ſheets. His atlas of Bengal, and his map of the ſouthern provinces.

Of Perſia there is no good modern map; but La Rochette publiſhed a beautiful one, to illuſtrate the expedition of Alexander the Great.

Of Arabia there are ſome good partial maps in Niebuhr's journey.

Of the Aſiatic Iſlands there is an excellent chart by Arrowſmith, in four ſheets.

Of Auſtralaſia, or *New Holland*, the beſt drawing is contained in Arrowſmith's chart of the Pacific ocean.

Maps of Africa.—The beſt general map of Africa is ſtill that of D'Anville, though ſome little additions may be made to it, derived from the journeys of Park and Brown. Major Rennell's partial maps may be conſulted with advantage.

Of Abyſſinia there is a good map in Bruce's travels.

Of Egypt, the beſt maps are that of the Delta by Niebuhr, and that of Lower Egypt by la Rochette.

Of the Mahometan States, the beſt maps are thoſe by Shaw, and a chart of the Mediterranean in four ſheets, by Faden.

Of the Cape of Good Hope, the beſt is Barrow's ſurvey.

Maps of America.—There is no modern general map of America that can be relied on. The beſt is that of D'Anville, in five ſheets, publiſhed in 1746 and 1748.

Mr Arrowſmith has publiſhed an excellent map of North America, on a very large ſcale, but has omitted the Spaniſh dominions.

Of the United States, the beſt map is Arrowſmith's in four ſheets, publiſhed in 1802; and there are very good maps of the individual provinces in Morſe's American Geography.

Of the Britiſh Poſſeſſions in America, beſides Arrowſmith's map above mentioned, there is a good map of Upper Canada by Smith, in one ſheet.

Of the Weſt India Iſlands, the beſt map is that of Jefferys in 16 ſheets, from which a ſmaller one in one ſheet has been reduced.

Of South America, the beſt map is that publiſhed by Faden in 1799, in ſix ſheets, from an engraving done at Madrid ſome years before.

APPENDIX.

127 Obſervations on the ſtudy of geography.

BEFORE we conclude this article, we muſt make a few obſervations on the method to be followed for acquiring or imparting geographical knowledge.

As ſome knowledge of geography, as well as of chronology, is abſolutely neceſſary, before hiſtory can be properly underſtood, the rudiments of theſe ſciences ſhould be learned, as ſoon as the capacity of the pupil will allow. It happens fortunately, that ſome of the moſt uſeful parts of geography, thoſe which conſider the relative ſituations, extent and boundaries of countries, with the manners and cuſtoms of their inhabitants, are highly intereſting; and provided that a knowledge of them be conveyed to a child in a pleaſing manner, they are well fitted to intereſt his curioſity, and awaken his attention. The more ſcientific parts of geography, and a detailed account of the minute circumſtances reſpecting each country, though extremely uſeful, and indeed neceſſary to the more advanced ſtudent, may be withheld for a little without any great loſs, till his age and judgment permit him to ſee their utility and application.

In teaching geography to very young children, their chief attention ſhould be directed to thoſe circumſtances which are moſt intereſting; and even with this limited view much may be learned at a very early period. For this purpoſe the diſſected maps that are uſually ſold at toy ſhops, may be employed with conſiderable advantage; but it is to be regretted, that the maps uſed in preparing theſe are ſeldom taken from the moſt correct copies. Thoſe works alſo which, under the diſguiſe of fictitious voyages and travels, are intended to convey a geographical knowledge of various countries, afford a very pleaſing and profitable method of inſtruction. A late work of this kind, by M. Jaufret, entitled *the Travels of Rolando*, may be advantageouſly put into the hands of young people; and, as they are farther advanced, the travels of Anacharſis the younger by the abbé Barthelemi will give them conſiderable information reſpecting the manners, cuſtoms, and hiſtorical events of ancient Greece.

When the young ſtudent is ſufficiently advanced to proſecute the ſtudy of geography on a more extenſive and ſcientific plan, it would be deſirable that he ſhould begin by reading ſome elementary treatiſe on aſtronomy, ſuch as that of Mr Bonnycaſtle, or the *Spectacle de la Nature*; or, if he has acquired a proper degree of mathematical knowledge, he may read Laplace's *Syſteme du Monde*, the aſtronomical part of *Robiſon's Mechanical Philoſophy*, or the aſtronomical article in this dictionary.

It may happen, that, from a defect of early education, or want of time, a preliminary courſe of aſtronomy cannot be commanded. Still, however, conſiderable progreſs may be made in geography, by the mechanical means of maps and globes. The ſtudent ſhould, therefore, provide himſelf with a pair of the beſt globes, choſen according to the directions laid down in N° 107; and with a few good maps of thoſe countries which

are moſt intereſting, particularly maps of Europe, Aſia, Africa, and North and South America, the Britiſh iſlands, France, Germany, Italy, Ruſſia, and Denmark, which may be collected from the liſt given at N° 126.

Being provided with theſe materials, the ſtudent ſhould firſt read over Chap. I. of Part II. of this treatiſe, or a ſimilar part of ſome elementary work in geography. On the elementary principles of geography we would recommend the general principles prefixed to Mr Patteſon's general and claſſical Atlas; and for teaching the uſe of the globes, Bruce's Introduction to Geography and Aſtronomy. For a complete account of modern geography we cannot refer to a better work than that of Mr Pinkerton; and for a combined account of ancient and modern geography, the pupil may have recourſe to a work on that ſubject by Dr Adam of Edinburgh.

After reading over the preliminary part above mentioned, the pupil may go through the ſecond Chapter of Part II. ſolving all the problems as he goes along on the terreſtrial globe; and thus he may proceed progreſſively through the whole article, leaving that part of Part I. which treats of the hiſtory of geography for the laſt object of his enquiry.

In ſtudying the particular circumſtances of each country, the pupil ſhould always have the map of the country before him; and, as he goes along, ſhould trace there the ſituation of each particular place; of the principal mountains, lakes, the ſources and directions of the rivers, the form and bounding of the ſhores, &c. In his progreſſive view of particular geography, it will be proper for the pupil to begin with the country in which he reſides; and, after having made himſelf maſter of that, to proceed ſucceſſively to thoſe which border on it, or whoſe connection with it is the moſt intereſting.

Thus an inhabitant of theſe iſlands, after having taken a view of EUROPE in general, ſhould make himſelf acquainted with BRITAIN and IRELAND (by peruſing the articles ENGLAND, SCOTLAND, and IRELAND in this Dictionary or in other works); whence he may proceed to FRANCE and its dependencies in the NETHERLANDS, SWITZERLAND, ITALY; thence to GERMANY and the AUSTRIAN territories, PRUSSIA, SWEDEN, DENMARK, and RUSSIA; whence he may return to the ſouth of Europe to SPAIN, PORTUGAL, and TURKEY, &c. After Europe, the United States of AMERICA will probably be found the moſt intereſting; the pupil may therefore ſtudy the geography of NORTH AMERICA before that of ASIA. From ASIA he may proceed to AUSTRALASIA and POLYNESIA; thence to AFRICA, and ſo conclude with SOUTH AMERICA. Nothing will contribute more to the advancement of geographical ſtudies than the conſtruction of maps. If the pupil has time therefore he ſhould early be inſtructed in this part of the ſubject by at firſt drawing a map of the world according to the directions laid down in N° 118. then one of Europe, and ſo of other quarters and countries. In conſtructing this map, it will be proper firſt to lay down thoſe places which are near the coaſt, in order to form the outline of the maritime part of the country, and only the moſt remarkable places inland, eſpecially thoſe which are ſituated in the courſe of the principal rivers. In every map the moſt prominent feautures of the country, as the mountains, lakes, rivers, and principal cities and towns, ſhould firſt be attended to, and from theſe the pupil may be introduced to the other places in the order of their magnitude or importance.

The moſt agreeable and intereſting method of ſtudying particular geography, after having become acquainted with the elementary principles of the ſcience, would be to peruſe the beſt books of voyages and travels; for from thoſe, where the traveller can be depended upon, the moſt correct ſyſtems of geography are compiled. Many of theſe, however, are too prolix and particular to be put into the hands of moſt young people, and a judicious abridgement of the beſt of them will anſwer every purpoſe; and perhaps Dr Mavor's collection may be recommended, as the beſt of the kind in the Engliſh language. For thoſe whoſe time and convenience will admit of their reading the beſt writers of voyages and travels, there is no want of ſuch works; and Mr Pinkerton has given at the end of his excellent work, a liſt of the beſt in moſt languages. We ſhall here only notice a few of the beſt and lateſt.

Pennant's Tours in Britain.
Young's Tours in the Britiſh iſles.
Saintfond's Travels in England and Scotland.
Young's Travels in France.
Holcroft's Tour in France.
Spallanzani's Travels in the two Sicilies.
Cox's Travels in Ruſſia, &c.
Pallas's Travels in the Ruſſian empire.
Carr's Northern Summer.
Staunton's Account of China.
Barrow's Travels in China.
Percival's Account of Ceylon.
Syme's Embaſſy to Ava.
Collins's Account of New South Wales.
Bruce's Travels in Abyſſinia.
Barrow's Travels in Africa.
Park's Travels in the interior of Africa.
Brown's Travels in Africa.
Sonnini's Travels in Egypt.
Percival's Cape of Good Hope.
Mackenzie's Journey in North America.
Davis's Travels in America.
Mackinnon's Tour in the Weſt Indies; with the voyages of Anſon, Byron, Cook, Phipps, Bligh, Wilſon, Wallis, La Peyrouſe, &c. &c.

INDEX.

Problems

GEOLOGY.

INTRODUCTION.

Introduction. 1

Definition and object of geology.

THAT part of natural hiſtory which treats of the internal ſtructure of the earth, as far as we have been able to penetrate below its ſurface; of the arrangement of the materials of which it is compoſed, and of the changes which have taken place in theſe, is called GEOLOGY, from γη, the *earth*, and λόγος, *a diſcourſe*. This ſcience has been called by Werner, GEOGNOSY, and is by him defined to be *that part of mineralogy which conſidering minerals as a part of our globe, treats chiefly of their bearings and poſitions with reſpect to each other* (A). Till of late this department of literature was called phyſical geography, but at preſent the terms GEOLOGY and GEOGNOSY are generally adopted; of theſe we have preferred the former, as being equally expreſſive and more familiar; under this head we propoſe to include every thing that is uſually comprehended under what have been called *theories of the earth*. Introduction.

* *Journ. de Phyſique* tom. lv. p. 444.

GEOLOGY differs from COSMOGONY as a *part* from the

(A) Werner has probably made this trifling change from a deſire of novelty; and ſome of his admiring pupils have attempted to diſplay in very pompous but puerile terms, that it is of great value and importance.

Introduction. the whole; the object of the latter is to give an account of the creation of the *univerſe*, while the former confines itſelf to the conſideration of the planet which we inhabit.

Geology is intimately connected with mineralogy, and may indeed be ſaid to depend on this as its very foundation. Werner, as we have ſeen, conſiders *Geognoſy* as a part of *Mineralogy;* but we are diſpoſed to concur with Mr Kirwan, who, ſpeaking of mineralogy with reſpect to its relation to geology, calls it "the alphabet of the huge and myſterious volume of inanimate nature.

2 Diviſion. Geology may be divided into deſcriptive and ſpeculative; the former giving a general account of the materials of which the globe is compoſed, and of their arrangement; while the latter is ſtrictly confined to what may be called a theory of the earth, or an attempt to explain the manner in which the ſtructure and arrangement have been brought about, and the changes that have taken place in the diſpoſition of the component parts of the earth.

3 Importance of the ſcience The ſcience of geology is of conſiderable importance in many points of view.

4 to the naturaliſt; 1. The ſtudent of natural hiſtory cannot but derive a great fund of profit and advantage from a ſcience, which makes him acquainted with ſo large a department of nature. Mineral bodies, whether we conſider them as individuals of nature, or as collected into thoſe maſſes which form the ſtrata of the earth, and the mountains that riſe above its ſurface, are peculiarly intereſting to the naturaliſt, as well from the variety of form and beauty of appearance which ſome of them preſent, as the uſeful purpoſes to which many of them are applied. The other kingdoms of nature delight us with the diſplay of order and deſign exhibited in their organization, or intereſt us from the intimate connexion which ſubſiſts between many of them and ourſelves. Theſe are objects of the *beautiful;* while the ſtupendous mountain, the awful volcano, the towering cliff, the gloomy mine, and the majeſtic cavern, are objects of the *grand* and the *ſublime*.

5 to the miner; 2. To the miner, and all thoſe who are employed in ſearching the bowels of the earth for the treaſures which they contain, geology, as well as mineralogy, forms an eſſential qualification. Experience has ſhewn that certain minerals and metals are found more frequently attached to ſome of the ſtony materials of the earth than to others, and that a few of them are only found in particular ſtrata. Examples of this kind will be given preſently. We have alſo learned that the arrangement of the materials in the earth is ſo far regular and uniform, that when we know the particular materials near which certain metals and minerals are commonly found, and the uſual diſpoſition in theſe places; and when we find in another ſituation the ſame materials diſpoſed in a ſimilar manner, we are pretty certain that the metal or mineral of which we are in ſearch is not far diſtant. We are therefore encouraged to proſecute the ſearch with every probability of ſucceſs. Thoſe who undertake to direct an inveſtigation of this kind, or to carry on the operations requiſite for the obtaining what is ſought would do well to inform themſelves beforehand of ſuch facts as are well eſtabliſhed reſpecting the diſtribution of the materials of the earth, and the ſubſtances uſually found connected with them. For want of this neceſſary information, we often ſee projectors impoſe on the credulity, and impoveriſh the finances, of gentlemen of landed property, who are led to ſuppoſe that they poſſeſs on ſome part of their eſtate a rich vein of metal, ſeam of coal, &c. the working of which will conſiderably improve their income. Introduction.

6 to the landed proprietor; 3. The failure of undertakings of this kind, partly from the villany of the projector, and partly from the ignorance of his employer, ſhews the advantages that gentlemen of landed eſtates would derive from the ſtudy of geology. An acquaintance with this ſcience would guard them againſt the artifices of deſigning men, and prevent them from embarking in uncertain and expenſive projects, the iſſue of which is too often ruin and diſappointment.

7 and to the Chriſtian. 4. But the ſtudy of geology boaſts a ſtill higher advantage. Nothing has more contributed to demonſtrate the truth of the divine writings, and to clear up many doubtful paſſages in them, than the diſcoveries that have lately been made in the ſtructure and formation of the earth. The original ſtate of the globe is ſo intimately connected with that which it at preſent exhibits, that we cannot properly underſtand the latter without referring to the former; and recent experience has ſhewn that the obſcurity in which the philoſophical knowledge of this ſubject was involved, has been highly favourable to thoſe ſyſtems of atheiſm and infidelity which prevailed in the laſt age. Much of this obſcurity is now removed; and the inveſtigations of Whitehurſt, Werner, Kirwan, Howard, and ſome other geologiſts, by proving that the ſuppoſition of a deluge is the only hypotheſis on which we can account for the preſent ſtate of our globe, have contributed as much to the advancement of true religion as of philoſophical knowledge.

"So numerous indeed, and ſo luminous, have been the more modern geological reſearches, and ſo obviouſly connected with the object we have now in view, that ſince the obſcuration or obliteration of the primitive traditions, ſtrange as it may appear, no period has occurred ſo favourable to the illuſtration of the original ſtate of the globe as the preſent, though ſo far removed from it. At no period has its ſurface been traverſed in ſo many different directions, or its ſhape and extent under its different modifications of earth and water been ſo nearly aſcertained, and the relative denſity of the whole ſo accurately determined, its ſolid conſtituent parts ſo exactly diſtinguiſhed, their mutual relation, both as to poſition and compoſition, ſo clearly traced or purſued to ſuch conſiderable depths, as within theſe laſt thirty years. Neither have the teſtimonies that relate to it been ever ſo critically examined and carefully weighed, nor conſequently ſo well underſtood, as with- in the latter half of the 18th century *."

* *Kirwan's Geol. Eſſays,*

8 Difficulties attending the ſtudy not inſurmountable. Geological reſearches ſeem at firſt view to be attended with almoſt inſurmountable difficulty. It is evident that the part of the earth which it is in our power to examine, is infinitely ſmall when compared to that which is entirely beyond our reach: and even much of the elevated parts, that appear above the ſurface, would ſeem to be ſo completely cut off from us by inacceſſible precipices, and the ice and ſnow with which the ſummits

Introduction.

mits of ſome of them are perpetually covered, that our knowledge of their ſtructure and compoſitions muſt for ever remain imperfect. Much of theſe difficulties, however, is rather apparent than real. It is true that our reſearches can extend but a very little way below the ſurface; but ſo far as our experience has yet taught us, any farther inveſtigation would be rather a matter of curioſity than utility. Thoſe metals and minerals which prove of moſt ſervice to mankind, are found at no very great depth in the earth, and ſome of them almoſt on its ſurface; and when we have penetrated beyond theſe, the materials diſcovered are of a nature ſo uniform, and of a texture ſo firm and hard, that it is poſſible they may extend even to the centre. Again, the inveſtigations of Sauſſure, De Luc, Dolomieu, and Humboldt, have proved that the moſt dangerous precipices, and the higheſt ſummits of thoſe immenſe mountainous chains which traverſe the earth in ſo many directions, oppoſe but feeble barriers to perſevering induſtry and philoſophic ardour.

The diverſity which occurs in the ſtructure and local arrangement of ſubterraneous ſubſtances, ſeems to throw another difficulty in the way of the geologiſt; but the farther his reſearches are extended, the more will this apparent diverſity be diminiſhed. The practical ſkill which ſome miners poſſeſs in many parts of the world, proves that the mazes of this labyrinth are not without a clue; and we may ſafely conclude, that when our knowledge of the ſtructure of the earth, and the diſpoſition of its materials, ſhall be ſtill farther extended, the greater part of the obſcurities under which the ſubject is now veiled, will be entirely removed. Multiplied obſervations of later years have enabled us to form certain general concluſions, and lay down certain general laws, which muſt materially aſſiſt future obſervers.

9 Principal improvers of geology.

In the modern improvements of geology the Germans led the way, and Lehmann may be conſidered as the father of the ſcience. Eminently ſkilled in general phyſics, practical mining, mineralogy, and chemiſtry, and fully acquainted with the circumſtances attending the relative ſituation of moſt mineral bodies in very extenſive tracts of different countries which he examined, he was enabled to deduce, from a long ſeries of obſervations, ſome general concluſions, which have, with ſome exceptions, been ſince verified in every part of the world.

Lehmann was followed in his own country by Ferber, Gmelin, Born, and Werner; in Sweden by Bergman, Cronſtedt, and Tilas; in Italy by Arduini; in Switzerland, by Sauſſure and De Luc; in Ruſſia, by Pallas; in France, by Delametherie, Saint Fond, Dolomieu, and Lavoiſier; and in Britain, by Hutton and Kirwan, names which muſt ever be held in the higheſt eſtimation by the cultivators of this part of natural hiſtory.

10 Method of ſtudying geology.

Before entering on the ſtudy of geology, it is neceſſary to acquire a competent knowledge of chemiſtry, and a pretty extenſive acquaintance with mineralogy, as theſe ſciences form an eſſential introduction to the more general reſearches reſpecting the ſtructure of the earth. The former ſupplies the means of aſcertaining the nature of the ſubſtances met with; and the latter muſt be well underſtood, before we can arrange theſe ſubſtances under their proper heads, and before we can comprehend the terms employed by geological writers. Introduction.

The ſtudy of this ſcience, like that of ſome other parts of natural hiſtory, particularly botany, can be proſecuted with but little advantage in the cloſet. The ſtudent muſt examine the declivities of hills, the beds of rivers, the interior of caverns and of mines, the receſſes of the ravine, and the utmoſt ſummits of the mountain, before he can obtain that degree of knowledge which is neceſſary to conſtitute a ſkilful and philoſophic geologiſt. While making theſe perſonal obſervations, he ſhould ſtudy the works of the beſt writers, and compare the facts related and deſcribed by them, with thoſe which he himſelf has obſerved. The writings on this ſubject may be divided into two principal claſſes, one comprehending theſe works which contain a ſyſtematic account of the whole, or ſome part of the ſubject; ſuch as Bergman's Phyſical Geography, the Geological Eſſays of Kirwan, the *Theorie de la Terre* of Delametherie, the writings of Werner, &c.: and the ſecond compriſing thoſe works which treat of the geology of particular countries in the familiar ſtyle of travels; as Born's Travels in Hungary, Ferber's Travels through Italy, Sauſſure's *Voyage dans les Alpes*, Pallas's Travels, Jar's *Voyages Metallurgiques*, Saint Fond's Travels in England and Scotland, &c. After having acquired a knowledge of the principles and general facts of the ſcience from the former, the ſtudent will, by means of the latter increaſe his knowledge in the moſt familiar and agreeable way.

11 Arrangement.

In the ſketch of geology which we are to give in the following article, we ſhall conſider the ſubject under four general heads, which will be the ſubject of as many chapters.

In the firſt chapter we ſhall deſcribe the arrangement and diſtribution of the materials of which the earth is compoſed. Here, after giving ſome general notion of that arrangement, we ſhall conſider each of the principal materials under a ſeparate ſection, in which we ſhall firſt lay down thoſe general marks by which each is diſtinguiſhed, deſcribe its general arrangement, and mention the places, eſpecially in Britain, where the ſubſtance is found in greateſt abundance, and thoſe metallic or mineral bodies which are commonly found in connection with it.

After having briefly conſidered each ſubſtance, we ſhall, in the ſecond chapter, bring the more general diſtribution of them under one view, ſtill directing our attention to the arrangement of theſe materials in the Britiſh iſlands.

In the third chapter we ſhall give a brief outline of the moſt remarkable theories that have been framed in modern times, to account for the diſtribution of mineral bodies, and the manner in which we find them now arranged. In this chapter we ſhall dwell more particularly on the two rival theories which at preſent divide the geological world, and ſhall enumerate ſome of the objections which have been made to each.

In the fourth chapter we ſhall give ſome account of the derangement of the ſubſtances that compoſe our globe, ſo far as it has originated from known cauſes; and this will lead us to the conſideration of EARTHQUAKES and VOLCANOES.

CHAP.

Arrangement, &c. of the Materials of the Earth.

Chap. I. *Of the Arrangement and Diſtribution of the Materials of which the Earth is Compoſed.*

12 General diſtribution of the materials of the earth.

The materials of which the general maſs of the earth is compoſed, are variouſly diſtributed in different parts. In ſome places they form irregular maſſes or blocks, either buried below the ſurface, or elevated to a greater or leſs height above it. In moſt places, however, the materials are arranged in a more regular manner; thoſe of the ſame kind being collected into extenſive maſſes, lying in layers or ſtrata, above or below a ſimilar maſs of another kind, or theſe alternate with each other to a conſiderable depth. Theſe ſtrata are ſometimes found arranged in a direction parallel to the horizon; at others they are vertical, or perpendicular to the horizon, appearing as if the horizontal ſtrata had been lifted up, and laid upon their edges. More commonly the ſtrata are arranged in a direction inclining to the horizon, when they are ſaid *to dip*.

13 Stratification.

The uppermoſt ſtratum is in moſt places covered to a certain depth with mould that has evidently been formed from the decompoſition of organized ſubſtances. In many parts of the earth this mould extends to a very conſiderable depth, and conſtitutes the ſoil; in other places it is barely ſufficient to form a coating to the ſtrata, and in others it is entirely wanting.

14 Horizontal and vertical ſtrata.

A good inſtance of horizontal ſtrata occurs about two miles to the eaſt of Balleycaſtle in the north of Ireland, of which we ſhall ſpeak more particularly by and by. One of the moſt curious examples of vertical ſtrata in Britain is found in the ſmall iſland of Caldey, on the coaſt of Pembrokeſhire, where the ſtrata of which the whole iſland is compoſed are placed in ſuch a manner, that their edges are all expoſed to view, and they may be ſucceſſively examined from the one end of the iſland to the other. It is ſeldom that an opportunity offers of examining the arrangement of ſtrata ſo eaſily as is afforded in this ſmall iſland. In moſt caſes it is neceſſary to penetrate to great depths before we can acquire an imperfect knowledge of the ſtratification of the earth; and in no inſtance have we yet proceeded a mile below the ſurface. In Caldey iſland, however, the ſtrata may be examined to the extent of more than a mile, beginning at what may be ſuppoſed the uppermoſt ſtratum, which is not more than a foot thick, to that which may be called the loweſt, at the oppoſite end of the iſland, being a maſs of red ſtone of more than a mile in depth.

15 Derangement of the ſtrata.

Sometimes the ſtrata are continued in a regular arrangement, preſerving the ſame inclination to a very conſiderable extent; but more commonly they appear in ſome parts ſeparated, as if they had been broken aſunder. Theſe ſeparations are uſually in a perpendicular direction, and the cavities are found filled with various heterogeneous matters. Sometimes theſe are chiefly compoſed of fragments of the adjacent ſtrata, but for the moſt part they conſiſt of mineral or metallic ſubſtances of a different nature.

When theſe fiſſures are filled up with broken fragments or rubble, as it is called, it very commonly happens that they become the beds of brooks or rivers. Thus the river Derwent runs for a conſiderable extent in Derbyſhire over a fiſſure of this kind. When the fiſſure is filled up with a ſolid ſtony matter, this forms what in Scotland is called a *dyke*. If a maſs of mineral or metallic matters fill the fiſſure, or be inſinated between the ſtrata, it forms what is called a vein, and theſe veins ſometimes branch between the ſtrata in various directions.

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When a fracture has taken place in the ſtratified maſs, one part of the maſs ſometimes preſerves the ſame poſition as it had before, or ſtill forms a continued line with the other parts of the maſs, or is parallel to it; but more frequently one part is thrown out of its original poſition, and becomes more inclined to the horizon than before. Sometimes one ſide of the maſs is more depreſſed than the other, as is commonly ſeen in many of the ſtrata in Derbyſhire; at others the two parts of the maſs are ſo diſturbed as to incline, towards each other, as if they had been broken upwards. When the edges of the ſtrata on each ſide of the fiſſure are thus divided and diſarranged, they are ſaid by the miners *to trap*.

The chaſms thus formed are ſometimes of conſiderable width. Some are found in Cornwall nearly 20 feet acroſs, and almoſt full of metallic and other mineral ſubſtances. It not unfrequently happens, that theſe fiſſures are empty, containing nothing but water in the bottom. A celebrated chaſm of this kind is ſhewn at the Peak in Derbyſhire; and if a ſtone be thrown in, it is heard to ſtrike from ſide to ſide for a conſiderable time, till at length it ſeems loſt in ſubterraneous water.

If the country in which the ſtrata lie runs in a waving direction of hill and dale, the ſtrata uſually preſerve the ſame waving direction, keeping pretty nearly parallel to each other. A curious example of this kind has been deſcribed by Gerhard, as occurring in the diſtrict of Mansfield in Germany. See fig. 1. In thoſe places where ſome remarkable diſlocation of the ſtrata has not taken place, their diſtribution is in general extremely regular, certain materials lying above or below certain others in an uniform manner. The obſervations of later geologiſts have diſcovered pretty nearly the arrangement that takes place in moſt countries; and we ſhall preſently give ſome examples of the ſtratification of ſeveral parts of Europe. Before we attempt this, however, we muſt mention ſome circumſtances in which the materials compoſing the ſtrata differ from each other.

Plate CCXXXVIII.

16 Strata in general regular.

17 Diviſion of the materials.

The general obſervation of all modern geologiſts proves, that all theſe materials may be diſtributed under two general claſſes; one conſiſting of thoſe ſubſtances which are found more or leſs connected with the remains of organized bodies, as the bones, teeth, and ſhells of animals, the trunks of trees, and other parts of vegetable bodies; and the other comprehending thoſe in the ſubſtance of which theſe organic remains are never found. As it is now generally believed that the latter of theſe are of a formation prior to the former, we ſhall here adopt the general diviſion of them into primary and ſecondary. We might go ſtill farther in this diviſion, by arranging them under more heads; one, for example, containing thoſe in which organic remains are ſparingly found, and others containing thoſe ſubſtances which are found only in particular places; but as the firſt of theſe involves in it a particular theory which we ſhall notice fully hereafter, and the others allude to facts which will be mentioned when treating of the ſeparate materials, we ſhall not here extend our

Arrangement, &c. of the Materials of the Earth.

division beyond the distribution of the materials into primary and secondary.

In the following short detail, many terms will occur which can be understood only by the mineralogist. They will be fully explained under the article MINERALOGY. The names which we shall give to the substances described will be such as have been most generally adopted in this country; but to prevent ambiguity, we shall, where it seems to be necessary, add the synonymous names that occur in the best geological writings.

A. Primitive Compounds.

SECT. I. *Of Granite.*

18 Granite described.

THE name *granite* has long been applied to all stones which are composed of an aggregate of quartz, feldspar, and mica, distributed in such a manner as that each of them appear in a separate state; but as this definition has been considered as too loose, and comprehending too many varieties, the name is at present restricted to that kind of granitic stone in which the quartz, feldspar, and mica, are found in grains or crystals. Of the three substances, the feldspar is generally the most abundant, and the mica the least so.

Granite is found in the lowest and the highest situations of the earth that have yet been examined. It forms the basis of all the other strata; and though these are sometimes found below it, this situation seems to have been the consequence of some accident, by which the inferior substances were thrown below the granite. Many mountains seem almost entirely composed of granite, as Gefrorn one of the Rhætian Alps; and there is a high hill of white granite about six miles to the west of Strontian in Scotland. Sometimes large masses of granite are found in a detached situation at some distance from the mountains to which they appear to belong; and these masses seem in some instances to have been broken off, and rolled down the mountain, and in others to have been carried away by irresistible torrents, or dislodged by earthquakes. On the summits of the mountains near Port Sonnachin in Scotland, are found large quantities of detached pieces of granite, some of them of amazing size *.

* *Mawe's Derbyshire*, p. 132.

19 Its different states.

Granite is most commonly found in vast blocks, separated from each other by rifts or chasms, irregularly disposed. This is the case in most mountains, especially in those which have high, pointed spires. The structure of these blocks is pretty uniform, there occurring seldom more than two varieties, one called porphyritic granite, in which the basis is of a fine grain, containing large crystals of feldspar. Of this variety many instances occur in the north of Scotland, and near Carlsbad in Bohemia. The other principal variety is that in which the granite is found in distinct globular concretions, composed of concentric lamellæ. This variety was observed by Mr Jameson, on the road between Dresden and Bautzen; and Mr Barrow, in his description of the Cape of Good Hope, mentions several globular concretions of immense size. The isle of Arran in Scotland also affords instances of the same variety. It is also found in Corsica, and is often called Corsica granite.

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It has been doubted by some geologists, whether the true granite is ever found stratified; but numerous instances of its stratification have been lately adduced, that leave no room to doubt that this is sometimes the case. Pallas takes notice of some stratified granite on the banks of the river Berda, where what he considered as perfect primitive granite, compactly crystallized, is disposed in layers of various degrees of thickness, some not exceeding one-eighth of an inch, and bounded both above and below by blocks of solid granite †. Again, on the banks of the Gromoklea, he observed similar layers of granite running in a direction from north to south, each bed being from one span to three feet six inches in breadth, and consisting of the most perfect primitive granite, which he considers as a continuation of that mineral tract which produces the cataracts of the Dnieper ‡. Mr Playfair mentions an example of stratified granite which he saw in Chorley forest in Leicestershire, where real granite is disposed in beds on the eastern border of the forest, especially near Mount Sorrel. Another instance of real granite disposed in regular beds, is also mentioned by Mr Playfair as occurring near the village of Priestlaw in Berwickshire ||. Mr Jameson observed the Riesengebirge, which separates Silesia from Bohemia, to be for 150 miles composed of granite disposed in horizontal strata, and he observed a similar stratification in Saxony and Lusatia §.

20 Stratified.

† *Pallas's Trav.* vol. i. p. 521.

‡ *Ibid.* vol. ii. p. 503.

‖ *Playfair's Illustrations*, p. 328.

§ *Nich. Jour.* 8vo. vol. ii. 227.

Granite constitutes the base of most of the British mountains, but is more commonly met with in the north and western parts of the island. There is a considerable mass of granite which runs longitudinally through Cornwall, from Dartmore to the Land's End *. Considerable masses are found in Scotland, but their extent has not been accurately ascertained. According to Mr Playfair, there is no mass of any magnitude in the southern parts, except that of Galloway, which occurs in two pretty large insulated tracts. Mr Playfair thinks that Dr Hutton greatly underrated the quantity of granite in Scotland, which, especially in the north, he considers as extending over a large district. If we suppose a line to be drawn from a few miles south of Aberdeen, to a few miles south of Fort William, it will, according to Mr Playfair, mark out the central chain of the Grampians, along which line there are many granite mountains, and large tracts in which granite is the prevailing rock †.

21

* *Playfair*, 310.

† *Illustrations*, p. 346.

It is remarkable that in the mountainous regions of Peru, especially in the environs of the volcanoes, no granite is found, except in very low situations, at the bottom of valleys ‡.

‡ *Annal. du Muf. Nat.* tom. iii. 399.

22 Decay of granite.

Several varieties of granite are subject to decay, from the decomposition of the feldspar which they contain. This circumstance will probably explain a curious fact. It is found that the granite existing in the interior of mountains is much softer than that near the surface, probably from the decay of the feldspar in the latter, while it remains in its original state in the former (B).

Granite

(B) The decomposition of granite appears to go through several stages, from the solid rock to the loose sand. These

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Granite is by no means abundant in metallic and the richer mineral ſubſtances; it, however, contains a conſiderable variety, ſome of which have as yet been found in no other ſubſtance, eſpecially molybdena. Iron ores are very commonly found in granite, eſpecially the compact brown iron ſtone. It ſeems to be owing to the preſence of iron that granite aſſumes that fine reddiſh colour with which we ſometimes ſee it tinged. One of the moſt remarkable inſtances of this kind is afforded by the rocks to the ſouth-eaſt of the valley of Chamouni, at the foot of the Alps. Theſe rocks, from their red appearance, are called *Les Aiguilles Rouges*, or the red needles. Theſe rocks were mentioned by Sauſſure, but he had not aſcertained their compoſition. This has ſince been done by M. Berger, who found them to be compoſed of granite, with a conſiderable quantity of oxide of iron *. Biſmuth, cobalt, blende, galena (an ore of lead), and ſeveral ores of copper, are alſo ſometimes met with; but the metal moſt frequently found in granite is tin, eſpecially in the great mining field in Cornwall.

23 Metals found in granite.

* *Jour. de Phyſ.* tom. lvii. p. 277.

Sect. II. *Gneiſs.*

24 Gneiſs deſcribed.

Gneiss, by ſome writers called *kneiſs*, is not unfrequently† confounded with granite, from which it differs rather in the arrangement than in the nature of its component parts. Theſe in gneiſs are arranged in a ſchiſtoſe or flaty form, whereas in granite, they are in diſtinct grains or cryſtals, the layers being generally in the direction of the mica. It ſometimes is intimately incorporated with maſſes of granite, but, in moſt inſtances, it repoſes on the granite, being generally the ſecond layer. In deſcending into the valley of Chamouni, Sauſſure obſerved a fine bed of true granite incorporated with a rock of gneiſs, which was arranged in very fine leaves†. Sometimes the gneiſs lies entirely below the granite; but this is uncommon. More generally there is found a vertical maſs of granite, with ſtrata of gneiſs on each ſide of it. Very frequently granite and gneiſs alternate with each other.

† *Voyage aux Alpes*, p. 676.

25 Where found.

Sometimes whole mountains are compoſed of gneiſs. Thus, Ben Lomond ſcarcely contains any other ſubſtance, and the Schaw, which is the moſt northern point of the northernmoſt of the Shetland iſlands, is entirely gneiſs. Mountains of this kind are, in general, neither ſo high nor ſo ſteep as thoſe of granite, though Mount Roſa in Italy, and a few others, muſt be excepted. The ſummits of theſe mountains are alſo generally more rounded than thoſe of granite mountains. The baſes of all the Shetland iſlands ſeem chiefly compoſed of gneiſs, and the middle part of the Pyrenees is almoſt wholly formed of this and granite.

It is curious that where gneiſs is contiguous to granite, its quartz and feldſpar are more apparent, and the mica leſs ſo; while, where it is more diſtant from granite, the contrary happens ‡.

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Several metallic ores are found in gneiſs, particularly thoſe of iron, as the magnetic iron ſtone, and martial pyrites; lead ores, tin ores, blende, cobalt, copper, and arſenical pyrites, and not unfrequently ſilver ores.

26 Metals found in gneiſs.

‡ *Kirwan's Eſſays*, p. 175.

Sect. III. *Micaceous Schiſtus.*

27 Micaceous ſchiſtus.

This is otherwiſe called *ſchiſtoſe mica*, and *mica ſlate*. It is alſo compoſed of the ſame materials with granite and gneiſs, except that it contains little or no feldſpar; the quartz and mica being arranged in layers as in gneiſs.

This ſubſtance alſo is very abundant in moſt rocks and mountains. It generally compoſes the third layer or ſtratum, being immediately above or without the gneiſs. It not uncommonly appears to be the only ſubſtance compoſing the hill or mountain, from the gneiſs and granite being probably ſo completely covered as to be out of ſight.

28 Where found.

Micaceous ſchiſtus compoſes the rocks that are found immediately to the north of Dunkeld in Scotland, and it is here penetrated in every direction by veins of quartz. The ſouthern ſhores of Loch Tay, the mountains of Glen Lochy, the vale of Tumel between Loch Tumel and Loch Rannoch, contain much of the ſame ſubſtance; and the lower part of Glen Tilt is chiefly compoſed of it. In the weſtern Highlands towards Ben Lomond, micaceous ſchiſtus alſo abounds, and ſome of it is found in the north of Argyleſhire. The Shetland iſlands are moſtly compoſed of micaceous ſchiſtus, in thick layers above the gneiſs, with a few maſſes of granite interſperſed.

It not unfrequently happens that a bed of micaceous ſchiſtus is interſected by veins of granite. Mr Jameſon obſerved an example of this in Glen Drummond in Badenoch, of which he has given a plate. The veins are very large, and run acroſs the ſtrata of ſchiſtus in a direction nearly parallel to each other *.

* *Min. of the Iſles*, vol. ii. p. 173.

29 Metals in it.

The metallic ores found in micaceous ſchiſtus, are chiefly thoſe of iron, copper, tin, lead, cobalt, and antimony.

Sect. IV. *Quartz.*

30 Quartz.

Quartz is not unfrequently found diſtinct from feldſpar and mica, and ſometimes whole mountains are found compoſed of it. In particular, the mountain of Kultuc, at the ſouth-eaſt end of the lake of Baikal, among the Altaiſchan mountains, which is 4800 feet long, 350 high, and above 4000 broad, conſiſts entirely of milk-white quartz; and the mountain of Flinz-

Theſe are thus marked by Mr Jameſon. In its beginning diſintegration it ſplits into maſſes, having a greater or leſs tendency to the quadrangular form; but theſe maſſes have ſtill a degree of connexion amongſt themſelves, as is the caſe upon the mountain top. The next ſtep is the enlargement of the fiſſures, by which the maſſes are looſened from their connexion, and tumble down from their elevated ſituations, upon the ſummits of the neighbouring mountains, or are hurried with impetuous velocity down the mountain ſide, covering the bottom of the glens with their ſtupendous ruins. Laſtly, Theſe detached maſſes, by the action of the weather, are completely diſintegrated, forming a looſe ſand, which is left upon the tops or ſides of the mountains, or is carried in great quantities to the ſea ſhore by the torrents. *Jameſon's Mineralogy of the Scottiſh Iſles*, vol. i. p. 82.

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berg in Luface, is almoft wholly compofed of it. There is alfo an extenfive ridge of quartz, fome miles long, in Bavaria, and Monnet mentions a rock of it 60 feet high. Mountains of it are alfo found in Thuringia, Silefia, and Saxony. It fometimes forms layers between gneifs and micaceous fchiftus. A confiderable body of granular quartz is found lying under micaceous fchiftus in the ifland of Iflay, fee fig. 4. *b*. It is often found forming fpires on the tops of mountains, and appearing like fnow.

Quartz is found in feveral parts of Britain; but there is very little of it in the fouthern part of the ifland. Williams found it very common in the Highlands of Scotland, where he has feen it regularly ftratified, with other regular ftrata immmediately above and below it; and fometimes compofing high mountains entirely of its own ftrata. Thefe ftrata are fometimes moderately folid; but often are naturally broken into fmall irregular maffes, with fharp angles, and of a uniformly fine granulated texture, refembling the fineft loaf fugar.

There are large and high mountains of this ftone in the fhires of Rofs and Inverneſs; and in a clear day thefe appear at a diftance as white as fnow, being quite bare of vegetation, except a little dry heath around the base of the hill *.

* *William's Mineral Kingdom*, vol. ii p. 52.

The mountain of Swetlaia Gera, one of the Uralian chain, confifts of round grains of quartz, white and tranfparent, and of the fize of a pea, united without any cement.

31 No metals in quartz.

No metals are found in quartz, though it fometimes contains petroleum.

Sect. V. *Argillaceous Schiftus.*

32 Argillaceous fchiftus defcribed.

This ftone, which is otherwife called *clay ſlate*, is the *thonchieffer* of Werner, and the *argillite* of Kirwan. It is of the fame nature with gneifs and micaceous fchiftus; but in this the ftratification is ftill more complete, and all traces of cryftallized granite entirely difappear. Doubts have arifen whether this ftone is primitive; but thefe are now cleared up, as it is frequently found alternating with gneifs and micaceous fchiftus, efpecially in Saxony, and with other primitive ftrata. It fometimes happens, too, that both gneifs and granite reft upon it.

There are two varieties of this ftone, one hard, and the other foft; but the hard often graduates into the fofter.

33 Where found.

Sometimes this ftone is found forming whole mountains; but more commonly it enters into them only partially. In fome, however, there are entire ftrata of it, as at Zillerthal, in the Tyrol. The famous mountains of Potofi confift entirely of argillaceous fchiftus, and Sauffure found it on the fummit of Mont Blanc.

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In Britain it is not very common; but is fometimes found on the higher parts of mountains. Thus it forms the fummit of Skiddaw in Cumberland.

Argillaceous fchiftus, efpecially the fofter variety, is remarkably rich in metals. We have faid that it forms the greater part of Potofi, one of the richeft filver mines. The ores of copper and lead, fulphur, pyrites, blende, and calamine, are alfo found in it. The great belly of copper ore in the Parys mountain in Angleſea, is found below this fubftance. It alfo fometimes contains antimonial and mercurial ores.

34 Metals found in it.

Sect. VI. *Jaſper.*

35 Jaſper defcribed.

It was fuppofed, by the earlier mineralogifts of the laft century, that jafper was only pure quartz, fo much penetrated by a colouring metallic oxide as entirely to deprive it of its tranfparency; but Sauffure and Dolomieu, with their ufual accuracy, difcovered that it confifts of flint, and not of pure quartz, having in combination a quantity of argillaceous matter, more or lefs mixed with oxide of iron.

Primitive jafper is always opaque. It is commonly found imbedded in other ftony matters. In colour it varies from red to green, and frequently confifts of alternate ftripes of red and green, fometimes perfectly diftinct, at others running together. There is a beautiful variety figured by Patrin, in which a dark-red ground is croffed in every direction with curved white lines, leaving here and there circular fpaces of red furrounded with white, forming eyes.

36 Where found.

Striped jafper is fometimes fo abundant, as to be the chief material of fome mountains, in which it is mixed with broken fragments of granite and other primary compounds (c). Mountains of red and green jafper alfo occur. Generally, however, it appears in ftrata, interpofed between layers of micaceous fchiftus, or alternating, and fometimes mixed with compact red iron ftone. It is found in the fouth of France, repofing on granite; and in the Altaifchan mountains, it fometimes lies below argillaceous fchiftus, but has there never been found in contact with granite. A coarfe kind of jafper is fometimes found in the hills near Edinburgh; and fome fine fpecimens are met with in the northern mountains.

Sect. VII. *Hornſtone.*

37 Hornſtone defcribed.

This ftone is confidered by Mr Kirwan as the fame with *petroſilex*, but Patrin and fome others diftinguifh them.

(c) There is often found interpofed between the ftrata of rocks, or fometimes above the upper ftratum, a bed of fragments that have been broken off from the principal ftrata. When thefe fragments chiefly confift of limeftone and calcareous compounds, whether they be of an angular form, or confift of rounded pebbles, they are generally called by the name of *breccia;* but when the fragments are of a filiceous or quartzy nature, efpecially if they are agglutinated together, fo as to form a folid mafs, they have ufually been called *puddingſtone*. From the uncertain manner in which thefe terms were employed, much confufion arofe, till Romé de l'Ifle, and other later naturalifts, have given the name of breccia to every ftony mafs that is compofed of angular fragments, of whatever nature they be; and they call by the name of puddingſtone every agglutinated mafs that is compofed of round pebbles, whether they be calcareous, quartzofe, or of any other nature. Thefe compounds will be fpoken of prefently in a feparate fection.

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them. According to Patrin, hornſtone is a compound primitive rock, compoſed of the ſame elements with granite, in which ſchorl is very abundant, communicating to the ſtone a dull, gray, or ſometimes blackiſh, colour, and containing a pretty large quantity of the argillaceous matter of mica. Petroſilex, according to him, is purer than hornſtone, and commonly of a grayiſh or greeniſh colour, ſemitranſparent, and very hard, ſo as to give fire with ſteel. They are often found united, and ſometimes form entire mountains, containing fragments of feldſpar interſperſed. They are commonly found in large thick maſſes or blocks, though they are ſometimes ſtratified like the ſchiſtoſe ſtones. Dolomieu is miſtaken, when he aſſerts that petroſilex is only found in primitive mountains, as it will appear hereafter, that it is ſometimes a ſecondary compound. At Tuhumas, in the iſle of Rona, Mr Jameſon found a maſs of rock chiefly compoſed of hornſtone and quartz, from 12 to 15 feet wide, and of conſiderable length lying between two beds of gneiſs.

Sect. VIII. *Pitchſtone.*

38 Pitchſtone deſcribed.

THE Germans have given the name of *pitchſtone*, or *pechſtein*, to a ſtony matter, which is found in large maſſes of an irregular form, and of different colours, as yellow, brown, red, green, &c. have ſometimes the appearance of roſin, and ſometimes that of an enamel, or of glaſs imperfectly tranſparent. It is never cryſtallized.

39 Where found.

It is found, either in large maſſes, or in veins. At Miſnia, it is found forming entire mountains; and in other countries there are mountains containing ſtrata of pitchſtone, ſometimes alternating with granite, at others with porphyry. Mr Jameſon deſcribes a large vein of it of a green colour, ſeveral feet wide, traverſing a maſs of red argillaceous ſandſtone, at Tormore in the iſle of Arran. This vein is extremely curious, and contains ſtratulæ of different ſubſtances depoſited in the ſame fiſſure *. Another curious vein of pitchſtone is deſcribed by him as traverſing a baſaltic rock, together with a vein of hornſtone, in the iſland of Eigg †. Mr Jameſon conſiders this as the firſt example of pitchſtone traverſing baſalt, diſcovered in Europe, though ſimilar appearances have been found on the top of the peak of Teneriffe.

* *Jameſon's Mineral. of the Iſles*, vol. i. p. 102.

† *Id.* vol. ii. p. 44.

Pitchſtone is only conſidered as a primitive rock, when it is nearly allied to porphyry.

Sect. IX. *Hornblende, and Hornblende Slate.*

40 Hornblende ſlate.

HORNBLENDE is ſometimes found exiſting ſeparately from the compounds in which it uſually occurs, as is the caſe in Siberia, where there are mountains of black hornblende. It is often found mixed with quartz, mica, feldſpar, or ſchorl, of a greeniſh or black colour. More commonly, however, it occurs in immenſe ſtrata, ſometimes in layers of gneiſs, argillaceous ſchiſtus, or primitive limeſtone. A ſtratum of it above primitive limeſtone has been found at Miltiz. It is ſometimes ſeen below granite, or granite is even found imbedded in it. A rock of hornblende, repoſing on granite, has been ſeen by Mr Jameſon in the iſle of Arran; and on the ſide of Loch Fine he found it alternating with ſtrata of micaceous ſchiſtus ‡.

‡ *Min. of Iſles*, vol. i. p. 72—144.

The principal metallic ſubſtances found in hornblende ſlate, are native ſulphuret of iron and copper ore.

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Sect. X. *Serpentine.*

41 Metals found in it.

SERPENTINE is a ſtone of a ſimilar nature with reſpect to its ingredients with thoſe we have been deſcribing. It takes its name from its appearance, being generally of a greeniſh ground, marked with white, yellow, brown, or reddiſh ſpots, ſo as to bear ſome reſemblance to the ſkin of a ſnake. Its green colour is owing to a quantity of ſlightly oxidated iron which it contains. It is uſually opaque; but ſometimes parts of it are ſemitranſparent, and though not very hard, is capable of receiving a good poliſh.

42 Serpentine deſcribed.

43 Where found.

Serpentine is by no means uncommon, and is often found in layers alternating with primitive limeſtone, or below gneiſs. The hill of Zobtenbeg in Lower Sileſia, conſiſts almoſt entirely of ſerpentine, diſpoſed in nearly vertical ſtrata, with a little hornblende interſperſed. Whole mountains of green ſerpentine are alſo found in Siberia, and near Genoa, where it is called *gabbro* or *pulverezza*. It is alſo found near the White ſea, and the mountain of Regelberg in Germany is chiefly compoſed of it. Rocks of it are found near the Lizard Point, on the coaſt of Cornwall; and hills of it occur in ſome of the Shetland iſlands.

Metals are ſeldom found in ſerpentine, except a magnetic ore of iron, which not unfrequently forms a part of the ſerpentine rocks, imparting to them its magnetic power. Veins of copper ſometimes traverſe it.

Sect. XI. *Porphyry.*

44 Porphyry deſcribed.

PORPHYRY generally conſiſts of the ſame materials as granite, but in different proportions, and having altogether a different appearance; for inſtead of being cryſtallized as in granite, we find in the true porphyries an uniform compact maſs, in which are diſſeminated ſmall cryſtals of feldſpar, and ſometimes of ſchorl. There are, however, many varieties forming ſhades between granite and true porphyry, ſeveral of which are deſcribed by mineralogiſts.

45 Where found.

Porphyry is very abundant in many ſituations, forming a conſiderable part of hills, and even mountains. It ſometimes alternates with gneiſs, and has been found below it. Gneiſs has alſo been found in the midſt of porphyry. It ſometimes occurs in the midſt of micaceous ſchiſtus, and ſometimes forms an external covering to other primitive ſtrata. Whole mountains of porphyry, arranged in immenſe ſtrata, ſometimes repoſe on a baſe of granite or gneiſs. This ſtone is found in the greateſt abundance in ſeveral places between the tropics, eſpecially in South America, where it is ſometimes met with at immenſe heights *.

* *Ann. de Muſ. Nat.* vol. iii. p. 400.

Porphyry is very common in moſt parts of Scotland, and, in particular, forms a conſiderable ſtratum at the top of the Calton hill at Edinburgh, being in ſome places 12 or 15 yards thick, covering a bed of breccia.

Porphyry is found in conſiderable quantity between Newcaſtle and Wooler, and blocks of it of conſiderable ſize may be every where ſeen ſcattered about in the fields. The feldſpar of theſe porphyries being leſs durable than the reſt of the ſtone, is partly deſtroyed in

ſome

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some blocks, and appears corroded in others; from which circumstance the porphyries are so porous, as to appear as if they had been burnt. Porphyries of a similar appearance are found in the mountain of Esterele in Provence, on the road from Frejus to Antibes*.

* *Saint-fond's Travels*, vol. i. p. 164.

There is a variety of porphyry mentioned by Charpentier, a great part of whose composition is indurated clay, and nodules of clay of different colours are found in its substance. Specimens of a similar nature occur in the western islands of Scotland. There is also a species of porphyry nearly allied to hornstone.

46 Metals found in it.

The two varieties last mentioned are rich in metallic ores; in the former there being formed ores of silver, copper, iron, lead, and antimony; and, in the latter, sparry iron ore, native sulphuret of iron, galena, black blende, and ores of bismuth.

47 Schistose porphyry.

A stone of a porphyritic nature is described by Werner under the name of *schistose porphyry*, and is considered by Kirwan as the same with the horn slate of Charpentier. It is found among the primitive rocks of Altai, and on the borders of the lake of Baikal, in which latter place it is mixed with granite and hornblende. It is also found in Siberia, and in Bohemia. Saussure found it near Pfaffensprung, intercepted between strata of gneiss.

Sect. XII. *Puddingstone and Breccia.*

43 Puddingstone and breccia.

49 Examples of breccia.

The distinction between these two stony matters was mentioned in note c: they are both sufficiently common, consisting of different materials. The breccia usually lies in bodies, almost at the top of the other primitive strata, with some of which it sometimes alternates. Stratified breccias, consisting of fragments of flints and jasper, cemented by hardened clay, are frequently found in Siberia, and sometimes alternate strata of breccia, porphyry, jasper, and other primary compounds, compose a considerable part of mountains. Some mountains in the north of Scotland contain masses of breccia, composed of fragments of red granite, micaceous schistus, and quartz, in a base of sandstone. Mount Scuraben contains strata of this kind, surmounted by a rock of white quartz. Similar appearances take place at Cromarty, at Murray frith, and two or three miles to the south of Aberdeen; but in many of these instances the breccia must be considered as secondary. Much of the northern coast of Scotland abounds with breccia.

50 Of puddingstone.

Puddingstone is also extremely common. A mountain of it is found in Siberia, near the rivulet of Tulat, being composed of fragments of jasper, chalcedony, aigue marine, and cornelian, cemented by a quartzose matter. Immense heaps, and even a mountain of puddingstone, are found at Meisenheim, in the Palatinate. Puddingstone is found in considerable abundance in passing from Loch Ness to Oban, in Scotland, and between Inverness and Dunolla. Large detached rocks of puddingstone were seen by Pallas in the village of Temirdski, in the Crimea. Some of these masses are seven or eight fathoms long, lying one above another †.

† *Pallas's Trav. in Crimea*, vol. ii. p. 197.

Sect. XIII. *Syenite.*

51 Syenite.

This name has been introduced by Werner, to denote a primary rock, essentially composed of grains of feldspar and hornblende, intimately blended together, in which the hornblende is generally most predominant. He first called it *greenstone*, but afterwards gave it the name of *syenite*, as he supposed it similar to a stone described by Pliny, as found at Syene in Upper Egypt, where it was dug in great quantities, and from thence carried to Rome, for the purpose of building public edifices.

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Syenite sometimes contains a few grains of quartz and mica; but these seem to be accidental, and are always in very small quantity. This stone is not commonly stratified.

Syenite usually overlays most of the other primary rocks, and has often a bed of breccia interposed between it and the inferior strata. It is very commonly found reposing on porphyry.

52 Where found.

It is found in Saxony, in the environs of Dresden; at Meissen in Thuringia; in Hungary, and in general in almost all primitive chains of mountains, especially in the Alps. It is doubtless the same which Saussure found in the summit of Mont Blanc, and which he calls *granitelle*.

53 Metals in it.

Metallic veins are not unfrequently found in syenite. At Scharffenberg, veins of silver and lead are found in it; and it is said, that the veins of strontian in Argyleshire run in a similar rock.

Sect. XIV. *Primitive or Granular Limestone.*

54 Primitive limestone.

It was long doubted whether limestone was ever to be found unmixed with organic remains, or primitive; but the observations of late mineralogists and geologists have fully proved, that primitive limestone exists in considerable quantity. This stone is of granular structure, and of a whitish gray colour, though frequently of a dark iron gray, or reddish brown. It is sometimes scaly or lamellar; at others nearly compact, and is now and then found to have a splintery fracture. It is generally unmixed with other primary compounds; but sometimes particles of mica, quartz, hornblende, &c. occur in it.

55 Where found.

This stone is always found alternating with the primary strata, especially with gneiss, micaceous, and argillaceous schistus. It sometimes forms whole mountains, as in Stiria, Carinthia, and Carniola, in Switzerland and in the Pyrenees, being often found seven or eight thousand feet high. Three mountains in Switzerland, all exceeding 10,000 feet in height, are chiefly composed of it. In these situations it commonly forms immense blocks, without any regular dip or direction; but it is sometimes stratified, as at Altenberg near the lake of Neuenberg. It is sometimes interposed between syenite and hornblende slate. One of the most singular mountains of granular limestone is that of Filabres in Spain, consisting of a block of white marble three miles in circumference, and 2000 feet high, without any mixture of other earths or stones, and with scarcely any fissure.

A considerable part of Mont Perdu in the Pyrenees is composed of alternate vertical bands of granite, porphyry, limestone, hornblende, and petrosilex.

Granular limestone is found in various parts of Britain, especially in the north of Scotland. One of the most remarkable examples of it occurs in the island of Islay;

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Iſlay; the central part of which is formed of a compact bed of it of conſiderable extent. See fig. 4. *d*. It alſo occurs in ſome other of the Weſtern iſles.

Primitive limeſtone often contains veins of metallic ore, eſpecially thoſe of galena, magnetic iron ore, blende, and pyrites.

56 Metals in it.

Sect. XV. *Primitive Trap.*

57 Primitive trap deſcribed.

Trap is a name that was long ago given by the Swediſh mineralogiſts, to diſtinguiſh certain ſtones that are of a compact texture, and a dark colour, compoſing part of ſeveral mountains. The word originally ſignifies a ſtaircaſe, and was given to mountains containing this ſtone, becauſe their ſtrata retire one behind the other like the ſteps of a ſtaircaſe. But as many rocks of a very different kind, both in their nature and formation, have received the common name of *trap*, conſiderable confuſion aroſe among mineralogiſts, with reſpect to what particular ſtones ſhould receive this appellation. Moſt of the French mineralogiſts, as Sauſſure, Dolomieu, and Saintfond, make trap to ſignify a primitive rock, but they do not always mean the ſame rock. Other mineralogiſts, eſpecially the Germans, underſtand by the name of trap, certain ſecondary rocks, and eſpecially what are commonly called *baſalts*.

Werner comprehends under the name of trap, ſeveral ſeries of rocks, which are principally characteriſed by their containing hornblende, which is found almoſt pure in thoſe which he conſiders as the moſt ancient, or what generally lie the loweſt; and it degenerates gradually in the ſucceeding ſtrata into a kind of blackiſh, ferruginous, hardened clay. He diſtinguiſhes three ſeries or formations of traps; primitive traps, tranſition or intermediate traps, and ſtratiform or floetz traps. We ſhall here conſider the firſt of theſe.

Primitive trap is almoſt wholly compoſed of hornblende, though it is ſometimes mixed with feldſpar, or more rarely with mica and ſome other ſubſtances. Under this general deſcription Werner comprehends four ſtony ſubſtances; hornblende and hornblende ſlate, which we have already noticed in Section IX. primitive greenſtone, and ſchiſtoſe greenſtone.

Primitive greenſtone is a mixture of hornblende and feldſpar; under this there are ſeveral varieties, according as its texture is more or leſs granular, or compact. 1. Common greenſtone, in which the hornblende and feldſpar are intimately blended, is granular, and bears conſiderable reſemblance to ſyenite, in which the hornblende is predominant. 2. A ſecond variety has ſmaller grains, in which are imbedded cryſtals of feldſpar, being of a ſtructure between the granular and porphyritic. 3. A third variety has the grains of hornblende and feldſpar extremely ſmall, ſo as to be ſcarcely diſtinguiſhable. This ſtone loſes its granular appearance, and becomes entirely porphyritic. 4. Laſtly, when the maſs becomes quite homogeneous, and of a complete green colour, it forms what was once called *green porphyry*, and conſtitutes the fourth variety*.

* *Brochant. Mineral.* om. ii. . 582.

Schiſtoſe greenſtone is compoſed of compact feldſpar, hornblende, and a little mica, of which the hornblende and feldſpar are nearly in equal quantity, and it now and then contains a little quartz. Its ſtructure is ſchiſtoſe.

We have been thus particular in deſcribing what Werner underſtands by primitive trap, as whatever may be thought of his theoretical opinions, his talent for mineralogical diſtinctions and characters cannot be called in queſtion.

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Mr Kirwan has given a long ſection on the diſtinguiſhing characters of trap, and its relation to baſalt, &c. in his Geological Eſſays. He thinks that there might be formed a natural ſeries of ſtones of a trap nature, taking in not only the compoſition, but alſo the texture, grain, and ſpecific gravity, as ſomething of this kind has been conceived and done by Werner.

58 Where found.

Primitive trap is often found in vaſt ſtrata in the midſt of gneiſs, and veins of it running through gneiſs, have been found in Knobſdorf in Sileſia, and in Bohemia. It is alſo ſometimes found in granite, and it is found paſſing through granite and micaceous ſchiſtus in the Weſtern iſles of Scotland. Saintfond found it alternating with granite, near St Malo; and Charpentier, with gneiſs. It ſometimes forms entire mountains, as in the territory of Deux Ponts; and in Norway it is found repoſing on granite. It ſometimes alternates with argillaceous ſchiſtus, as at Leidenburgh.

59 Metals found in it.

Primitive trap frequently contains metals, eſpecially the ores of iron and copper.

Sect. XVI. *Topaz Rock.*

60 Topaz rock.

This ſtone is compoſed of quartz, ſchorl, topaz, and lithomarga, (a kind of hardened clay) the three former ſubſtances conſtituting ſmall layers or plates alternating with each other. It ſometimes contains cavities or geods, lined on the inſide with cryſtals of quartz and topazes. The texture of this ſtone is between the ſchiſtoſe and the granular; that is, it is compoſed of plates or laminæ; but theſe laminæ are of a granular ſtructure.

Topaz rock is very rare. It forms part of a mountain near Averbach, in the metallic mountains of Saxony; but no metallic matter has hitherto been diſcovered in it.

Sect. XVII. *Siliceous Schiſtus.*

61 Siliceous ſchiſtus deſcribed.

Siliceous ſchiſtus, or flinty ſlate, is the kieſelſchiefer of Werner; but there ſeems ſome diſpute between his diſciples, whether it be a primitive or a ſecondary rock; on which account we have placed it laſt in the former ſeries. Brochant does the ſame; but Mr Jameſon, in his ſketch of the Wernerian geognoſy, places it among the tranſition formations, or thoſe which immediately ſucceed the primitive. It is thus deſcribed by Mr Jameſon. Its colour is bluiſh gray; it is internally dull; its fracture in the great is imperfectly flaty; in the ſmall, large ſplintery, paſſing into flat conchoidal; its fragments are indeterminately angular, and pretty ſharp edged; it is ſtrongly tranſlucent on the edges; it is hard and brittle, difficultly frangible, and not particularly heavy *.

* *Jameſon's Min. of Dumfries*, p. 48.

62 Where found.

An entire mountain formed of this ſtone is found in Luſatia, in which there are no petrifactions. It is alſo found in the Alps, interpoſed between gneiſs and hornſtone. Schlendgenberg, a mountain in Saxony, is for the moſt part compoſed of it, mixed with hornblende and feldſpar. Kirwan conſiders it as the ſame ſubſtance

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ſtance which Sauſſure calls *palaiopetre*, which is commonly conſidered as petroſilex.

Flinty ſlate is deſcribed by Mr Jameſon as among the mineral ſubſtances found in Dumfrieſſhire. He particularly notices an immenſe rocky maſs of it at the entrance of the valley at Leadhills, by which the metallic veins are completely interrupted *.

No metals have been found in it.

* *Mineralogy of Dumfries*, p. 64.

B. Secondary Compounds.

63 Secondary compounds.

THE ſubſtances which we are now to notice are diſtinguiſhed from thoſe which we have been deſcribing, in containing more or leſs the remains of organized beings. As the inferior ſtrata of theſe ſecondary compounds uſually contain fewer organic remains than thoſe above them, they are ſometimes ſubdivided into two orders, one of which is conſidered to be intermediate between the primary and ſecondary ſtrata. This is Werner's claſſification, of which we ſhall give an account in the next chapter.

SECT. XVIII. *Secondary Limeſtone.*

64 Secondary limeſtone deſcribed.

UNDER this title we ſhall comprehend what Werner calls tranſition limeſtone, floetz limeſtone, and limeſtone. Secondary limeſtone is a calcareous maſs, ſometimes granular, and ſometimes compact, the former approaching to primitive limeſtone. Its fracture is ſcaly, and it is ſometimes ſemitranſparent. In colour it is very various, ſometimes red, or rather blackiſh, with white veins, conſiſting of calcareous ſpar. It is often of a grayiſh caſt. It ſometimes forms vaſt blocks, without any appearance of ſtratification; at other times it is evidently ſtratified. It abounds with remains of marine animals, and often contains nodules of agate, and other ſimilar ſtones.

A variety of calcareous ſtone is deſcribed by mineralogiſts under the name of ſwineſtone. It is either compact, ſlaty, or porous, and is ſaid in general to contain no petrifactions, though ſome found in the mountain of Kinneculla contains many. It is conſidered by Kirwan as primeval limeſtone, impregnated with petroleum.

Limeſtone is ſometimes found in oviform balls, commonly containing a grain of ſand in them.

There is a variety of limeſtone that is very porous, and abounds in remains of vegetable matter, as impreſſions of leaves, &c.

65 Where found.

Secondary limeſtone is very abundant in moſt parts of the world, forming a conſiderable part of many mountains, and being often the principal ſtratum to a conſiderable depth below the ſurface. The mountain Iberg, in the Hartz, is compoſed of vaſt maſſes of it, irregularly rifted; and mountains of a ſimilar kind are found in Siberia and in the Vivarais. In ſome of thoſe mountains vaſt caverns have been formed. Secondary limeſtone mountains always repoſe on ſome primitive ſtone; thus, in Siberia their baſe conſiſts of granite, porphyry or hornblende; in Saxony, of granite, or granular limeſtone, and ſometimes of argillaceous ſchiſtus; in Switzerland, theſe mountains repoſe on argillaceous ſchiſtus or gneiſs, or ſometimes on calcareous puddingſtone. In the Crimea, there is an immenſe extent of ſecondary limeſtone, between Roſtof and Perekop, which is minutely deſcribed by Pallas. Great part of the ſummit of Mont Perdu, the higheſt of the Pyrenees, is compoſed of ſecondary limeſtone, arranged in nearly vertical ſtrata, and ſo full of the remains of marine animals as in ſome places to appear as if compoſed of nothing elſe. Here it ſeems to repoſe on granular limeſtone. Arrangement, &c. of the Materials of the Earth.

The baſe of Mount Ingleborough in Yorkſhire, which is near 30 miles in circuit, conſiſts entirely of limeſtone, containing vaſt quantities of ſea ſhells. This ſtone alſo forms the principal inferior ſtrata through the greater part of Derbyſhire, being arranged in beds of various degrees of thickneſs, from a few inches to about 200 fathoms in ſome places, not having been perforated; and abounding with ſhells, and other marine remains.

It is found in many quarries in Scotland diſtinctly ſtratified. Mr Jameſon notices quarries of limeſtone at Cloſeburn, and Barjarg, and at Kellhead in Dumfrieſſhire.

66 Metals found in it.

Secondary limeſtone often contains metallic veins, eſpecially in Derbyſhire, where it abounds with galena, blende, ſulphur pyrites, and copper pyrites. Sulphur is alſo ſometimes found in it. Kirwan remarks, that in the reſt of Europe limeſtone is ſeldom metalliferous.

67 Alabaſter.

The ſtone commonly called *alabaſter*, employed in making ſtatues and ornaments, is properly a carbonated lime, nearly allied to marble; though it is uſually ſuppoſed to be a variety of gypſum or plaſter ſtone. There is a gypſeous alabaſter that will be noticed preſently.

Calcareous alabaſter is not often white (though *as white as alabaſter* is a common proverb), but generally tinctured with iron of a yellow, brown, or reddiſh caſt. It is ſemipellucid, and uſually ſo ſoft as to be ſcratched by the nail.

It is commonly found in blocks, in marble quarries, as in the iſland of Paros, and in ſeveral parts of Italy, particularly in the territory of Volterra in Tuſcany, in Malta, &c. A variety is found in the form of ſtalactites of a conical or cylindrical form.

SECT. XIX. *Gray Wacke.*

68 Gray wacke deſcribed.

GRAY wacke is a ſtone compoſed of fragments of quartz and argillaceous ſchiſtus, cemented by an argillaceous matter ſimilar to the ſchiſtus, varying in ſize, from that of a hen's egg, till they are ſo minute as to be no longer viſible. It ſometimes contains a matter ſimilar to ſiliceous ſchiſtus.

There is a variety of this ſtone, called by Werner gray wacke ſlate, which is a ſimple ſlaty ſtone, which bears a conſiderable reſemblance to argillaceous ſchiſtus. From this, however, it is to be diſtinguiſhed, according to Mr Jameſon, by the following characters.

"It has ſeldom a greeniſh or light yellowiſh gray colour, as is the caſe with primitive ſlate, but is uſually aſh and ſmoke gray. It does not ſhew the ſilvery continuous luſtre of primitive clay ſlate, but is rather glimmering, which originates from intermixed ſcales of mica. Quartz ſcarcely occurs in it in layers, but uſually traverſes it in the form of veins. Further we do not find cryſtals of feldſpar, ſchorl, talc, chlorite ſlate, or magnetic iron ſtone are to be obſerved in it. It contains petrifactions, particularly thoſe varieties that border on gray wacke. It alternates with gray wacke *."

* *Mineralogy of Dumfries*

Theſe ſtones are diſtinctly ſtratified, but the direction of

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of their ſtrata is not parallel to that of the other rocks on which they lie. They are very commonly found covering limeſtone, eſpecially at the foot of mountains.

69 Where found.

Gray wacke is found in Erzgebirge, at Braunſdorf, Rieſberg, and Averbach, in Voegtland, in Tranſylvania, on the banks of the Rhine, in Lahnthal, and ſome other places in Germany. It is alſo found in Britain; and Mr Jameſon notices it among the minerals of Dumfrieſſhire, where the gray wacke ſlate is found near Moffat, in the vicinity of Langholm, in the higher parts of the valley of Eſk, and behind Burnſwark. The ſtrata found in theſe places yield a very good ſlate, nearly free from mechanical mixture, and well adapted to the roofing of houſes.

70 Metals found in it.

This ſpecies of ſtone is rich in metals; the greater part of the veins of lead and ſilver in the Hartz, eſpecially thoſe of Clauſthal and Zellerfeld, are in gray wacke. In Tranſylvania, in Voreſpath, it contains even rich mines of gold. The gray wacke ſtrata on the banks of the Rhine are alſo traverſed by ſome metallic veins, but thoſe of Saxony contain nothing but blind coal.

Sect. XX. *Secondary Trap.*

71 Secondary trap.

Several varieties of trap occur among the ſecondary ſtrata, and muſt be here enumerated. They all conſiſt principally of greenſtone, or that mixture of hornblende and feldſpar, which conſtitutes the primitive traps, noticed in Section XV. but in the traps we are now to mention, the mixture is much more intimate, the grains conſiderably finer, and the maſs appears homogeneous. We ſhall here notice only three principal varieties; the amygdaloid or toadſtone, the globular trap, and the greenſtone, called by the Wernerians tranſition greenſtone.

72 Amygdaloid or toadſtone.

1. The amygdaloid, called in Derbyſhire toadſtone, and ſometimes *cat dirt*, appears to conſiſt of hornblende ſlate in a ſtate of decompoſition, and appears very ſimilar to a kind of wacke, of a very fine grain. It is of a blackiſh colour, and very hard, and often contains a number of bladder holes, which are ſometimes entirely empty, at others are partially or wholly filled with ſpar.

It runs in immenſe ſolid beds, without any appearance of ſtratification or fiſſure, of unequal thickneſs, having been ſeen from 6 feet to 600 thick. It commonly alternates with the ſtrata of ſecondary limeſtone, as in Derbyſhire, and ſometimes ſeems to penetrate the inferior ſtratum of limeſtone to a very conſiderable depth. It contains no metallic veins, and it is ſaid entirely to intercept thoſe which it paſſes in the limeſtone ſtrata. Saintfond affirms that lead ore is ſometimes found in cat dirt; but he ſeems to have been deceived by the vagueneſs of the term, as the miners of Derbyſhire give the ſame name to a greeniſh variety of limeſtone, which is ſometimes traverſed by veins of lead ore.

73 Globular trap.

2. Globular trap. This is a ſchiſtoſe greenſtone, partially decompoſed, and alſo reſembles a fine-grained wacke; but it appears in the form of large balls, compoſed of concentric layers, with a hard nucleus. It is found at Altenzulze in Voegtland, and ſome other places. It ſometimes contains veins of copper and iron.

74 Greenſtone.

3. Greenſtone. This is almoſt entirely compoſed of feldſpar, uſually of a pale fleſh-red colour, having ſometimes imbedded in it grains of grayiſh quartz, ſcales of iron, blackiſh mica, and cryſtals of pale fleſh-coloured feldſpar. This rock may be confounded with porphyry, or with feldſpar; but is generally conſidered as different from both. Mr Jameſon found it in beds from three to twelve feet thick on the upper ſide of the Suſanna vein in the valley of Leadhills, and in the mountain between Wamphray and Eſkdalemuir.

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Sect. XXI. *Sandſtone, or Grit.*

75 Sandſtone.

These terms, like many others which we meet with in mineralogy, are very vague and indefinite, and are uſed to denote three or four kinds of ſtone; a calcareous, an argillaceous, and a ſiliceous ſandſtone. We ſhall here conſider only two of them, the argillaceous and the ſiliceous.

76 Argillaceous ſandſtone.

1. Argillaceous ſandſtone. This is the *ſandſtein* of Werner, and the argillaceous grit of the ordinary miners. It is compoſed of grains of quartz, and ſometimes of ſiliceous ſchiſtus; more rarely of feldſpar. Theſe grains are of various ſizes, and are cemented in an argillaceous matter, commonly containing iron: whence this ſtone is ſometimes called *ferruginous* ſandſtone. From the coarſeneſs or fineneſs of the grains, it receives the names of coarſe and fine ſandſtone. There is a very coarſe kind found in Derbyſhire; containing a conſiderable quantity of quartz pebbles.

This ſpecies of ſandſtone is found in immenſe beds, ſometimes above 100 yards thick.

It is very diſtinctly ſtratified, and is commonly divided by fiſſures, into the ſhape of parallelopipeds. It ſometimes alternates with layers of compact limeſtone, and often lies above a ſtone which we are immediately to mention, *ſhale* or *ſhiver*.

Sandſtone is ſometimes formed into globular concretions, compoſed of concentric lamellæ.

77 Where found.

Sandſtone is one of the moſt abundant products of nature, occurring in almoſt every country. In Britain it forms the uppermoſt ſtratum in many parts of Derbyſhire; and in the iſle of Arran there is an immenſe ſeparate maſs of it, forming what is called *the cock* *. In the ſame iſland it is found in Glenranza, repoſing on ſecondary limeſtone.

* *Jameſon's Min. of the Iſles*, vol. i. p. 76.

The globular concretions of ſandſtone are uncommon. Mr Jameſon obſerved them in the iſle of Skye, near the harbour of Portree †; and Reuſs obſerved the ſame in Bohemia ‡.

† *Mineral. of the Iſles*, vol. ii p. 87.

‡ *Mineral. Geograph. von Bohmen*, vol. ii. ſ. 46.

This ſpecies of ſandſtone uſually contains many petrifactions, but is generally not very abundant in metals; it however ſometimes contains veins of cobalt.

78 Siliceous ſandſtone.

2. Siliceous ſandſtone. This is a ſtone of a ſimilar nature with the laſt, except that the cementing maſs is alſo of a ſiliceous nature. It is found in the ports of Domica and Campara, in the iſle of Arbe, and on the coaſt of Dalmatia, where it contains petrifactions. The hill of Platinburg conſiſts of ſandſtone, with a chalcedony cement. Some fine ſpecimens of ſiliceous ſandſtone are found in Saliſbury Craigs at Edinburgh, containing ſhells which have aſſumed the nature of chalcedony. It does not appear to contain metals.

Sect. XXII. *Gypſum, or Plaſterſtone.*

79 Gypſum.

This is native ſulphate of lime, and it appears in ſeveral forms. Six varieties are uſually enumerated; common

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mon gypſum, lenticular gypſum, cryſtallized gypſum, fibrous gypſum, ſtalactitic gypſum, and gypſeous alabaſter.

80 Common.

1. *Common gypſum* is a compact, granulated ſtone, commonly of a grayiſh colour, and mixed with impurities, containing a conſiderable quantity of carbonate of lime. Its texture is ſeldom laminated, but it appears like coarſe loaf ſugar. This kind is very abundant, many hills being entirely formed of it. Of theſe the moſt remarkable are the plaſterhills in the neighbourhood of Paris, thoſe in the canton of Bern in Switzerland, and others among the Alps. Hills of gypſum occur alſo in Spain and Poland; near the White ſea; in Aſia, where they are moſtly in horizonal ſtrata; in the north Archipelago, between Aſia and America. Sauſſure found a mountain in Switzerland compoſed of gypſum, ſand, and clay *. This kind ſometimes contains petrifactions, and often abounds with the impreſſions of animal and vegetable matters; ſome very curious examples of which will be mentioned in a future ſection. In contains few metals, although copper is ſometimes found in it, as are rock-ſalt and ſulphur.

* *Voyage aux Alpes*, tom. ii. p. 528.

81 Lenticular.

2. *Lenticular gypſum* is a curious variety, which ſeems peculiar to Montmartre near Paris. In one of the banks in this mountain, ſpecimens of it are found containing little lenticular bodies, diſtinct and diſſeminated through the ſtony matter, ſo as to form a great part of its maſs. A ſpecimen of this kind is figured by Patrin, in his natural hiſtory of minerals.

82 Cryſtallized.

3. The *cryſtallized gypſum* is alſo found chiefly in the environs of Paris, in cryſtals that are decaedral, or ſometimes like a rhomboidal octaedron, with the pyramids truncated near the baſe.

83 Fibrous.

4. *Fibrous gypſum*, compoſed of ſhort brittle threads diſpoſed in bundles, is found in Derbyſhire, and near Riom in Auvergne. A very beautiful variety, of a ſilky feel, and reticulated texture, is deſcribed by Patrin, as found in Poland, in the ſalt mines of Wielitſka; in Ruſſia, near the junction of the river Oka with the Wolga; in Spain; and in China.

* *Hiſt. Nat. de Miner.* tom. iii. p. 218.

A variety of gypſum with the appearance of vegetation is found in caverns near the baths at Matlock in Derbyſhire. A beautiful ſpecimen of it is figured by Patrin *.

84 Stalactitic.

5. Gypſum is ſometimes found hanging from the ſides and roof of caverns in the form of ſtalactites, a tranſverſe ſection of which ſhews their internal ſtructure to be radiated. This variety is commonly called *ſchlot* *.

† *Patrin ut ſupra.* p. 222.

85 Gypſeous alabaſter.

6. *Gypſeous alabaſter* is very ſimilar to true alabaſter, except that it does not, like that, effervceſce with acids, and is in general not ſo ſtrong. It is found in great abundance in Derbyſhire in large maſſes, filling up cavities in argillaceous grit. It never forms a ſtratum, but is generally attended with gravel, red clay, and ſhells. Mr Mawe repreſents the lower portions as being very ſtrong and compact, ſo as to form columns and pilaſters ‡. This kind is alſo found in Franche Comté, and on the Marne about ſix leagues from Paris, at Lagny.

‡ *Mineral. of Derbyſh.* p. 84.

Though from the ordinary form or ſituation of gypſum, and the organic remains ſo commonly found in it, there can be no doubt of its being in moſt caſes a ſecondary rock; yet from its having been found mixed with mica in St Gothard, it is enumerated by ſome among the primary compounds.

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Sect. XXIII. *Fluor Spar.*

86 Fluor ſpar deſcribed.

This beautiful ſubſtance, which is native *fluat of lime*, is found either in large unformed maſſes or blocks, or cryſtallized in cubes or octaedrons. It is of different colours: but the moſt prevailing varieties are that in parallel zones or bands of green, blue, yellow, and white; and that in which a white ground is veined with a reddiſh brown. Some ſpecimens are ſo ſhaded as to repreſent a geographical map; but theſe are very rare. It is ſo ſoft as to be eaſily turned in a lathe into thoſe vaſes and other ornaments which are ſo commonly ſeen on chimneypieces.

86 Where found.

Fluor ſpar is found in ſeveral countries of Europe, but eſpecially in France and Britain. According to Patrin, there are mines of it in the primitive mountains of Gyromagny, in the Voſges, in the neighbourhood of Langeac, in Auvergne, and at Forez near Ambierle, that are inexhauſtible §. It is alſo found in the mountain of Pilat not far from Lyons; among the rocks that ſkirt the valley of Chamouni in the Alps; in the Altaiſchan mountains of Aſia; and in Greenland.

§ *Hiſt. Nat. de Miner.* tom. iii. p. 288.

The moſt productive mines of this ſubſtance in Britain are in a mountain near Caſtleton in Derbyſhire. Here there are two mines producing the beautiful compact fluor, called *Blue John*, which is found in pipe veins running in various directions. The fluor commonly reſts upon limeſtone, and it frequently has this ſtone for a nucleus, round which it appears to have cryſtallized. Frequently, however, the centre is hollow. In ſeveral parts of the mine the fluor is found in detached maſſes, in caves filled with clay and looſe adventitious matter, having the appearance as if it had been broken off from the limeſtone on which it had been formed; for every piece, in one part or other, ſeems as if it had adhered to ſomething, and been broken off.

Some of the pieces of fluor are a foot thick, and have four or five different veins or zones: ſuch large pieces are, however, very rare, and generally they are only three or four inches thick *.

* *Mawe's Mineral.* ſect. vii.

Saintfond, who has given an intereſting account of the curioſities near Caſtleton, ſays, that fluor ſpar would be the moſt beautiful ſubſtance in nature, if it were but a little harder.

It is alſo found in Northumberland, in a vein among the granite mountains of Aberdeenſhire †, and in one of the Shetland iſles, in a vein of baſalt ‡.

† *Jameſon's Min. of the Iſles*, vol. i. p. 153.

Fluor appears in ſome caſes to be primitive. Thus it is found forming whole ſtrata in the mountains of the foreſt of Thuringia, and in a vein of quartz in Upper Hungary.

‡ *Ib.* ii. 207.

Sect. XXIV. *Chalk.*

88 Chalk.

Chalk is too well known to require a deſcription. It is not always white, but is frequently coloured. It is diſpoſed in horizontal beds that are often many yards in thickneſs, and which always repoſe on layers of other calcareous ſtone of a harder ſtructure. Theſe beds are often of conſiderable extent, and very commonly

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ly contain flints, oviform limeſtone, and vaſt quantities of ſhells.

89 Where found.

Chalk, which is ſo abundant in ſome countries, is ſcarcely found in others. It is well known that the ſouth and ſouth-eaſtern parts of England, and the ſouth and ſouth-weſt of France contain vaſt cliffs and beds of it; much of it is alſo found in Zealand. It is, we believe, a rare production in Scotland, and in moſt mountainous tracts. It has been remarked by Pennant, that if a line be drawn from Dorcheſter in the county of Dorſet, to the county of Norfolk, it would form the boundary of the great chalky ſtratum of England; no quantity having been found to the north or weſt of that line.

There is a mountain of chalk between Tor and Iſium on the banks of the Donetz in Ruſſia, in which ſome Greek monks have excavated apartments to the length of fifty fathoms*.

* *Pallas's Travels*, vol. ii. p. 84.

No metals are found in chalk, though it is ſaid that in France *martial pyrites* has been diſcovered in it.

Sect. XXV. *Clay.*

90 Clay.

Clay is found in various ſtates with reſpect to hardneſs or ſolidity, from the ſoft ductile clay uſed by the potters and pipemakers to the perfect ſlate (clay ſlate, or *argillaceous ſchiſtus*) already deſcribed.

Soft clay is found in beds of various degrees of thickneſs, commonly not far below the ſurface, and alternating with harder clay, ſlates, ſand, or limeſtone. It is generally very abundant, eſpecially in thoſe places where coal or rock-ſalt is found.

91 Indurated clay.

Clay of a harder conſiſtence, commonly called indurated clay, or in the language of the miners *clunch*, is uſually found below the ſofter clay, or there is ſometimes a ſtratum of ſlate or ſimilar argillaceous matter interpoſed. It often alternates with limeſtone, ſandſtone, or gypſum. Petrifactions and ſhells are often found in it, as are quartz, ſulphur pyrites, martial ochre, common ſalt, vitriol and alum.

92 Lithomarga.

A harder ſtate of clay forms that ſubſtance which is called by mineralogiſts *lithomarga* (ſtone clay). This is found in beds or ſtrata often alienating with the former, with ſlate or with limeſtone, eſpecially in coal mines. It alſo forms neſts or balls in toadſtone and ſimilar rock. It ſometimes bears the impreſſions of reeds and other vegetable bodies.

93 Slate clay.

The next degree of hardened clay, forms ſlate clay, (*Schiefer thon* of the Germans). This ſubſtance, however is not very hard, but is eaſily broken into angular tabular fragments. Its internal appearance is uſually dull, but ſometimes glimmering from a ſlight intermixture of ſcales of mica. Its colour is uſually a yelloviſh gray, with ſpots or clouds of a pearl gray, or a cherry red, but ſometimes it inclines to black. It uſually lies between beds of ſandſtone, and almoſt always below the ſofter clays.

94 Slate.

A kind of clay, of a ſtill harder conſiſtence, forms ſlate or ſchiſtus. This is uſually of a dark brown or blackiſh colour, and a laminated texture. It lies in beds, ſometimes of immenſe thickneſs, uſually below ſandſtone, or alternating with this and limeſtone. It often contains impreſſions of organic remains, and there are ſometimes found in it veins of lead ore. It is a very common ſtratum in the coal countries.

Nearly allied to this is what the miners call rubble ſtone, which is a common variety of ſlate found in ſimilar ſituations with ſlate, but often very rich in metallic ores, eſpecially iron, galena, biſmuth, and cobalt. It alſo abounds with petrifactions. It is ſometimes found in primitive rocks.

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95 Rubble-ſtone.

Sect. XXVI. *Marl.*

96 Marl.

Marl is a ſubſtance chiefly compoſed of ſand, clay, and calcareous matter, which is found in many places, and forms one of the moſt valuable natural manures uſed in agriculture. This is alſo found of various degrees of hardneſs, from a ſoft powder to a ſtony conſiſtence, in which laſt ſtate it forms what Kirwan calls *marlite*. In colour it is uſually of a reddiſh white, ſometimes verging upon red, and it is not unfrequently found of a yellowiſh brown or blackiſh caſt. Marl is uſually diſpoſed in conſiderable beds of various degrees of thickneſs, in valleys and other low lands, eſpecially among the coal ſtrata. Indurated marl occurs in the coal ſtrata of Mid Lothian *, and it is alſo found in the iſland of Iſlay. Powdery marl is ſeen in Skye.

* *Jameſon's Dumfries*, p. 106.

Stony marl, or *marlite*, is found in Bavaria, alternating with ſand and ſandſtone. Hills of it occur in Carniola, Carinthia, and the Venetian territory. It is alſo found between ſtrata of limeſtone and argillaceous ſchiſtus.

Sect. XXVII. *Argillaceous Ironſtone.*

97 Argillaceous iron-ſtone.

This is ſometimes called metal ſtone, and is very common in the coal countries. It is very heavy and compact, and of various colours, from a dark brown to a blood red; the latter forms the *hæmatites* or bloodſtone, one of the richeſt iron ores. It often contains in it ſpherical balls like iron bullets. It is diſpoſed in ſtrata alternating with indurated clay, ſlate clay, marl, or ſandſtone, ſeldom far below the ſurface. It ſeldom forms very extenſive beds, but is often confined to particular ſpots.

Ironſtone is found in great abundance in Cumberland, and in moſt parts of Scotland. It may be ſeen in the cliffs all along the coaſt of Fife, from Dyſart to St Andrews.

Sect. XXVIII. *Wacke and Baſalt.*

98 Whinſtone.

We have already ſpoken of ſeveral ſtones under the name of *traps*, that are found both among primitive and ſecondary compounds. The two ſubſtances which we are now to notice are nearly allied to the traps, and have been claſſed with them under the general name of *whinſtone*. This is a favourite term among the mineralogiſts of Scotland, of whom Sir James Hall employs it as a generic name to denote trap, baſalt, wacke, grunſtein, and porphyry †. The term is convenient, but Profeſſor Jameſon and others of the Wernerian ſchool object to it as too vague and indefinite.

† *Edinburgh Phil. Tranſ.* vol. v. p. 46.

99 Wacke.

Wacke, or wacken, differs from trap only in being more compact and of a finer grain. It is heavy and very hard, ſo as often to ſtrike fire with ſteel; it is dull and opaque, and breaks with an even fracture. Its colour is uſually a reddiſh brown or gray of various

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shades, and sometimes it has a greenish cast. It has usually an earthly smell, when breathed on. It is sometimes highly impregnated with iron, and often contains crystals of *hornblende*, and very commonly those of hexagonal black mica.

It often forms a considerable part of mountains, either in vast blocks, as in the hill on which Edinburgh castle stands, or in strata lying above limestone or sandstone, or alternating with these. A great part of the Calton-hill, of Salisbury craigs, and Arthur's seat at Edinburgh, is composed of strata of this kind; and similar appearances take place in the bed of the water of Leith near the town, and in the cliffs on the coast of Fife, especially at St Andrews. To the eye of the volcanic Saintfond, all these beds appeared to be lava. We are disposed to think, with Mr Playfair, that the curious instance of alternate strata of basalt (as Saintfond calls it) and limestone, near Villeneuve de Berg, described and figured by that author, affords an example of whinstone alternating with limestone, such as are seen in Scotland †. Several varieties of wacke are found in the hills near Edinburgh, and are described by Dr Townson ‡. Mr Jameson observed wacke alternating with porpyhry in Skye.

† *Recherche sur les Volc.* p. 325.
‡ *Townf. Tracts*, p. 204.

100 Basalt.

Basalt has a finer grain, and is more compact, than even wacke, and is the most dense of all the whins or traps. It is found either in large blocks, covering the other strata, sometimes in the form of tables, or in regular prismatic columns, either straight or bended. We have already treated so fully of the nature, properties, and chief habitats of basalt (see BASALTES), that little remains to be added here.

It is principally distinguished from wacke, where it is not in regular prisms, by very rarely containing crystals of mica, which are so common in the latter.

Saintfond in his splendid work *Sur les Volcans eteints du Vivarais*, &c. has figured some examples of basaltic pillars which rival those of Staffa and the Giants Causeway. A more romantic situation is scarcely to be conceived than that drawn in his eleventh plate, of a village placed in the front of a bold hill covered with bundles of small pillars lying in every direction, and having detached perpendicular columns standing at each end, with a large cave directly behind the houses. Large masses of basalt are seen in the north of Shetland, standing insulated, and assuming a very grotesque appearance. Mr Jameson describes one of these in the isle of Jura, that forms a natural arch. We remember seeing two curious insulated rocks on the shore at the foot of Kinkeld braes at St Andrews, but do not recollect whether they are of a basaltic nature.

Several other substances, as sand, gravel, peat, &c. might here be noticed, but their structure and situation are too well known to render a particular notice necessary.

Many of the stones which we have described among the primitive rocks, are also sometimes found among the secondary strata, as argillaceous schistus, hornstone, hornblende, jasper, and especially puddingstone; but they are not so important as to require a second examination.

Before we conclude this general account of the materials which compose our globe, we must briefly notice two of the most valuable mineral productions, viz. rock salt and coal, and must say something of fossils and petrifactions.

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Sect. XXIX. *Rock Salt.*

101 Rock salt described.

Rock salt or sal gem, (the *steinsal* of the Germans) is the purest muriate of soda that is found in nature, it being much less impregnated with foreign matters than what is procured from sea water. It is very hard, and generally very transparent, being sometimes as clear as crystal. It is usually white, but often yellowish, blue, red, or violet, and now and then it is quite opaque. This salt forms in the bowels of the earth horizontal beds or banks, more or less thick, from a few inches to many hundred fathoms; and sometimes extending several miles round. It commonly alternates with clay or gypsum. The beds are sometimes without any break for a great extent. It is generally found a few fathoms below the surface, and in some places is found continued to the depth of 1000 feet.

102 Where found.

It is found in some mountains; and in Algiers, near the lake called *Marks*, there is a mountain almost wholly composed of it. The famous salt mine of Wielitska in Austrian Poland, about eight miles to the south-east of Cracow, is in the northern extremity of a branch of the Carpathian mountains. The salt found here is of an iron gray colour, intermingled with white cubes; and sometimes large blocks of salt are found imbedded in marl. This famous mine has been worked ever since 1251, and it is pretended that its excavations extend more than a league from east to west *. About five leagues to the south-east of Cracow are the salt mines of Boschnia, the depth of which is nearly equal to those of Wielitska (1000 feet); but the salt procured from them is less pure †. Mines of salt, in horizontal undulated beds, occur at Thorda in Transylvania, and in Upper Hungary. In the side of a mountain, about two leagues from Halle, on the banks of the Inn, to the north-east of Inspruck, rock salt is found imbedded in layers of a flaty rock; but there is one part of the mountain in which there occurs an immense body of salt, without any mixture of rock, to which they pass by a gallery 260 toises in length, closed at the end with a locked door. This salt is very impure ‡. There are three important salt mines in Spain; the first near Mingranella, in a mountainous tract, between Valentia and Castile, imbedded in layers of gypsum; the second in Spanish Navarre, in a ridge of hills composed of limestone and gypsum; and the third that of Cardona in Catalonia, about 16 leagues to the north-east of Barcelona, which is one of the most curious natural productions with which we are acquainted. It consists of an immense solid rock of salt, elevated 500 feet above the earth, and extending to a depth that has not been ascertained. It is without crevices or clefts, and has no appearance of strata, and is near a league in circuit. There is no plaster or gypsum found in the neighbourhood, and the salt rock is as high as any of the adjacent hills ||.

* *Townson's Travels in Hungary*, p 388.
† *Journ. des Mines*, N° 47.
‡ *Jar's Voy.* tom. iii. p. 328.
|| *Bowles's Nat Hist. of Spain.*

103 Salt mines at Northwich.

Rock salt in found is several places in England, particularly at Northwich in Cheshire, at Droitwich in Worcestershire, and near Weston in Staffordshire; but the mines in Northwich are the most productive. Salt mines, in this situation, were known to the Romans; but

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but the principal mine that is at preſent wrought, was diſcovered in the beginning of laſt century. It forms immenſe quarries, extending over ſeveral acres, which, with their huge cryſtal pillars and glittering roof, preſent a moſt beautiful ſpectacle. The ſalt found here is of a dark-brown colour, like brown ſugarcandy, and is ſo hard that it is blaſted with gunpowder to get it from the maſs. It is diſpoſed in beds, alternating with beds of clay, gypſum, and ſlaty ſtone. Salt is procured at the greateſt depth hitherto explored; and wherever a ſhaft is ſunk in the neighbourhood, there is a certainty of finding ſalt *.

* *Mawe's Mineralogy of Derbyſh.* ſect. xv.

Beſides theſe extenſive mines, rock ſalt is found in the canton of Berne in Switzerland, in Siberia, in Arabia, in Tibet, and even in New Holland. It is alſo found in many parts of America, at a great height in the mountains, eſpecially thoſe of Peru.

SECT. XXX. *Coal.*

104 Coal.

WE have already, in the articles COAL and COALERY, treated of the nature of this ſubſtance, of the ſtrata that are uſually found connected with it (according to the phraſeology of the miners), and of the method of procuring it from the pits; and, in MINERALOGY, we ſhall give a particular account of the ſeveral varieties, and the diſtinguiſhing characters of each. A few obſervations reſpecting the principal collieries, with the appearance of the coal found in them, and the correſponding ſtratification, fall to be made in this place.

There are certain general circumſtances that attend the depoſitions of coal in almoſt every place where it is found, and which we muſt mention before noticing the particular collieries. Theſe are as follows.

105 General circumſtances attending coal ſtrata.

1. The beds in which coal is diſpoſed, uſually have their extremities near the ſurface of the ground, from which they bend obliquely downwards, the middle part of the bed being nearly horizontal, ſo that a vertical ſection of the bed nearly reſembles the keel of a boat. This figure is well expreſſed in the firſt and third plates to Mr Jameſon's Mineralogy of Dumfries. The loweſt part of the bed is uſually the thickeſt (D).

2. A bed of coal is ſeldom found ſingle; but, in general, ſeveral ſtrata occur in the ſame place, of various thickneſs, the upper being uſually very thin, and the lower very thick, with ſeveral ſtony ſtrata between each two. Where there is only one bed, this is generally of very conſiderable thickneſs. At Whitehaven there are found at leaſt 20 coal ſtrata below the ſurface; and at Liege, in France, there are no leſs than 60.

3. The ſtrata that ſeparate the layers of coal are nearly the ſame in every colliery, and will be ſeen by referring to the table given under COALERY, and by thoſe which will immediately be added. Thoſe ſtrata which are in immediate contact with the coal, are either whinſtone, or more commonly an argillaceous ſlaty maſs; and near this is ſandſtone, in layers that are ſeparated by ſlaty clay, mixed with particles of coal.

4. It is an obſervation which holds, almoſt without exception, that the ſlaty ſtrata, and eſpecially thoſe next the coal, bear the impreſſion of vegetables, and often of exotic or unknown plants.

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106 Where found.

Coal, in a greater or leſs quantity, but of very different qualities, has been found in moſt countries, and perhaps exiſts in all. It is found in France, Holland, Britain, Germany, Saxony, Portugal, Switzerland, and Sweden; in China, Japan, and in New Holland; and much of it is worked in Virginia in America. But France and Britain may be conſidered as the favourite ſeats of this invaluable commodity, which may juſtly be put in competition with the treaſures of Potoſi and Peru.

107 Coal mines of France.

It is ſtated by Buffon, that there are no fewer than 400 collieries worked in France; and yet Saintford regrets that his countrymen are not ſo far advanced in the uſe of this mineral as the inhabitants of Britain *. The moſt conſiderable coal mines in France, are thoſe in the Lyonnois, at Forez, Burgundy, Auvergne, Languedoc, Franche Comté, and Liege.

* *Saintfond's Travels*, tom. i. p. 114.

The mines in the Lyonnois, and thoſe of Forez, are among the moſt important in France. They are ſituated in a valley, extending from the Rhone to the Loire, in a direction from north-eaſt to ſouth-weſt, between two chains of primitive mountains, and they occupy in length a ſpace of ſix or ſeven leagues, from Rive-de-Gier to Firmini. In one part of the the valley, in the neighbourhood of Saint-Etienne, the ſtrata are nearly horizontal, and the medial thickneſs of the coal ſtratum is from three to ſix feet; and near the Loire there are from 15 to 20 of theſe. At Rive-de-Gier the ſtrata are almoſt vertical, and their thickneſs is very unequal, being ſeldom leſs than three feet, and ſometimes amounting to 40 or even 60. All the coal produced by theſe mines is of an excellent quality, and its quantity is immenſe. Patrin ſtates, on the moſt undoubted authority, that there are in the neighbourhood of Rive-de-Gier, no leſs than 40 mines at work, which produced in one year 1,600,000 quintals of coal †.

† *Hiſtoire Nat. de Miner.* tom. v. p. 223.

The next in importance are the coal mines of Liege. The beds of coal in that country have a direction from eaſt to weſt; they commence about a league to the eaſt of the town, and extend to about a league and a half to the weſt of it. Here, after meeting with ſome interruption, they extend for ſeveral leagues farther. Their breadth, from north to ſouth, is about three-fourths of a league. At Verbios, which is to the north-weſt of the city, there are, according to Jars, more than 40 ſtrata of coal, which are ſeparated from each other by beds of different kinds of ſandſtone, of from 30 to 100 feet in thickneſs ‡. Gennetè has counted 61 of theſe beds, placed one above another; and he is of opinion, that the loweſt penetrates to the depth of 4000 feet perpendicular. Though theſe mines have been wrought from the 12th century, they have not yet reached to more than the twenty-firſt bed, at the depth of a little more than 1000 Engliſh feet §.

‡ *Jars' Voy. Metal.* Mem. xiv. p. 283.

§ *Patrin*, tom. v. p. 330.

The

(D) Saintfond, in the ſection which he has of the coal ſtrata at Newcaſtle, deſcribes them as if they were convex towards the upper ſurface. (See p. 134. of vol. i. of the Engliſh Tranſlation of his Travels in England, &c.). Surely this is a miſtake.

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108 Principal collieries of England.

The principal collieries of Britain are thoſe of Newcaſtle and Whitehaven.

Newcaſtle is ſurrounded by collieries to the diſtance of ſix or ſeven leagues, and may, perhaps, be conſidered as the richeſt coal diſtrict in the world. There are in ſeveral of the Newcaſtle mines not fewer than 16 beds of coal, two of which are conſiderably thicker than the reſt, being each about a fathom in thickneſs. Theſe are called the *main coal*, and are diſtinguiſhed into the *high main coal*, and the *low main coal*, ſeparated from each other by a conſiderable number of ſtony ſtrata. Good coal, in ſufficient quantity, is generally found at the depth of little more than 100 feet. The bed is five feet thick in ſome places, and leſs in others; but, in general, it is eaſily wrought, and large pieces are brought up. This laſt circumſtance is of conſiderable advantage, as theſe pieces are moſt proper for chamber fires, and eaſily tranſported, which makes this kind of coal ſell at a higher price. Where the bed of black and bituminous clay is penetrated, the coal is found adhering to it: but this is not always the caſe, for there are other mines in the neighbourhood where freeſtone is recovering, which, in the points of contact, is mixed with coal to the thickneſs of two or three inches; the latter running, as it were, in ſplinters into the ſtone, and having a ligneous appearance, when attentively examined *.

* *Saintfond's Travels*, vol. i. p. 140.

At Whitehaven, the beds of coal lie in a direction parallel to each other. Their inclination or dip is nearly to the weſt, and is from one yard in eight, to one in twelve. The ſtrata are frequently interrupted by large fiſſures, or dykes, ſome of which remove the ſtrata upwards or downwards, 120 feet. The courſe of theſe fiſſures is almoſt eaſt and weſt. In a depth from the ſurface of 165 and a half fathoms, there are, in theſe collieries, ſeven large beds of coal, and 18 thin beds, which cannot, at preſent, be rendered profitable.

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The ſtrata ſuperincumbent on the large beds of coal are, 1ſt bed, Blue ſlate. 2d, Gray freeſtone. 3d, Hard, white freeſtone. 4th, Blue ſlate, ſtriated or ſpeckled with freeſtone. 5th, Gray ſlate. 6th, Hard, white freeſtone.

The ſtrata immediately beneath theſe large beds of coal, are from one and a half to ſix inches thick, and conſiſts of a ſpecies of argillaceous earth, or *ſhale*. As this earth is of a very ſoft or friable nature, the weight of the ſuperincumbent ſtrata preſſes the pillar of coal through it. If the pillar deſcends a few inches, the roof not equally yielding at the ſame time, cruſhes, or breaks into ſmall pieces. When, under theſe circumſtances, the thickneſs of the bed does not exceed ſix feet, nor the depth 30 fathoms, the ſurface of the earth is ſenſibly affected *.

* *Dixon's Life of Dr Brownrigg*, p. 107.

There appear to be two principal belts of coal in this iſland, extending from the eaſtern to the weſtern coaſt; one from Newcaſtle to Whitehaven, the other from the eaſt coaſt of Scotland, acroſs the vale of Forth and Clyde, to Ayrſhire. Coal is indeed found in many other parts of the iſland; but the quantity is very trifling.

The ſimilarity of ſituation, and the ſimilar nature of the coal at Whitehaven and Newcaſtle, would naturally lead us to infer, that the coal at both places is from the ſame ſeam. But this is placed beyond diſpute, by a comparative examination of the ſtrata in both ſituations. We ſhall here give two tabular views of the ſtrata, one taken from Saintfond's Travels, and the other from Dr Joſhua Dixon's account of the Whitehaven mines, in his literary life of Dr Brownrigg. Allowing for the different names given by different miners to the ſame ſubſtances, and Dr Dixon's greater minuteneſs, there is a wonderful ſimilarity between the two tables.

TABLE I. Strata in Reſtoration Pit, St Anthon's Colliery, Newcaſtle, to the depth of 135 fathoms.—From *Saintfond*.

N°	Stratum.	Fath.	Feet.	Inch.
1	Soil and clay,	5	–	–
2	Brown freeſtone,	12	–	–
3	Coal, I.	–	–	6
4	Blue metalſtone,	2	5	–
5	White girdles,	2	1	–
6	Coal, II.	–		8
7	White and gray freeſtone,	6	–	–
8	Soft blue metal ſtone,	5	–	–
9	Coal, III.	–	–	6
10	Freeſtone girdles,	3	–	–
11	Whin,	1	4	6
12	Strong freeſtone,	3	1	–
13	Coal, IV.	–	1	–
14	Soft blue thill,	1	5	–
15	Soft girdles mixed with whin,	3	5	–
16	Coal, V.	–	–	6
17	Blue and black ſtone,	3	4	–
18	Coal, VI.	–	–	8
19	Strong freeſtone,	1	3	–
20	Gray metalſtone,	1	4	–

N°	Stratum.	Fath.	Feet.	Inch.
21	Coal, VII.	–	–	8
22	Gray poſt mixed with whin,	4	1	–
23	Gray girdles,	3	1	–
24	Blue and black ſtone,	2	2	–
25	Coal, VIII.	–	1	–
26	Gray metalſtone,	2	–	–
27	Strong freeſtone.	6	–	–
28	Black metalſtone, with hard girdles,	3	–	–
29	High main coal, IX.	1	–	–
30	Gray metal,	4	3	–
31	Poſt girdles,	–	2	–
32	Blue metal,	–	4	–
33	Girdles,	–	1	2
34	Blue metalſtone,	5	–	–
35	Poſt,	–	1	–
36	Blue metalſtone,	3	–	–
37	Whin and blue metal,	–	1	6
38	Strong freeſtone,	3	3	–
39	Brown poſt with water,	–	–	7
40	Blue metalſtone with gray girdles,	2	2	–
41	Coal, X.	–	3	–
42	Blue metalſtone,	3	–	3
43	Freeſtone,	–	4	–
44	Coal, XI.	–	–	6
45	Strong gray metal, with poſt girdles,	2	–	6
46	Strong freeſtone,	1	1	–
47	Whin,	–	1	–
48	Blue metalſtone,	1	2	7
49	Gray metalſtone, with poſt girdles,	2	4	5
50	Blue metalſtone, with whin girdles,	1	4	3
51	Coal, XII.	–	1	6
52	Blue gray metal,	–	3	8
53	Freeſtone,	2	–	7
54	Freeſtone mixed with whin,	2	–	–
55	Freeſtone,	1	2	–
56	Dark blue metal,	–	2	2
57	Gray metalſtone and girdles,	2	2	–
58	Freeſtone mixed with whin,	3	–	7
59	Whin,	–	1	–
60	Freeſtone mixed with whin,	1	–	6
61	Coal, XIII.	–	3	3
62	Dark gray metalſtone,	–	3	6
63	Gray metal and whin girdles,	1	4	10
64	Gray metal and girdles,	1	3	–
65	Freeſtone,	–	3	–
66	Coal, XIV.	–	3	2
67	Blue and gray metal,	–	4	2
68	Coal, XV.	–	–	9
69	Blue and gray metal,	2	–	–
70	Freeſtone mixed with whin,	–	4	6
71	Gray metal,	–	–	6
72	Gray metal and girdles,	1	–	9
73	Low main coal, XVI.	1	–	6

TABLE II. Strata in Croft Pit at Preſton-Hows near Whitehaven, to the depth of 107 Fathoms. From *Dixon*.

N°	Stratum.	Fath.	Feet	inch.
1	Soil and clay,	1	1	–
2	Brown ſoft limeſtone,	1	3	–
3	Dark-coloured limeſtone, harder,	1	–	–
4	Yellowiſh limeſtone mixed with ſpar,	–	4	–
5	Reddiſh hard limeſtone,	–	3	6
6	Hard dark-coloured limeſtone,	–	1	4
7	Yellowiſh limeſtone mixed with ſpar,	–	4	–
8	Soft brown limeſtone,	–	4	2
9	Soft brown and yellow limeſtone mixed with freeſtone,	–	2	6
10	Limeſtone mixed with yellow freeſtone,	–	2	–
11	Reddiſh ſoft freeſtone,	–	1	6
12	Red ſlate, ſtriated with freeſtone in layers,	–	2	6
13	Red freeſtone,	7	–	6
14	Soft red ſtone,	–	–	6
15	Red ſlate ſtriated with red freeſtone,	4	1	–
16	Red ſlate ſtriated with freeſtone,	4	3	–
17	Strong red freeſtone, rather grayiſh,	4	5	9
18	Lumpy red freeſtone ſpeckled with white freeſtone,	–	–	9
19	Blue argillaceous ſchiſtus ſpeckled with coal,	–	–	9
20	Red ſoapy ſlate,	2	1	–
21	Black ſlate with a ſmall appearance of coal,	–	1	–
22	Aſh-coloured friable ſchiſtus,	–	4	6
23	Purple-coloured ſlate,	3	5	3
24	The ſame, and under it black ſlate,	–	4	–
25	Coal, I.	–	1	–
26	Soft whitiſh freeſtone,	1	4	2
27	Blackiſh ſlate, a little inclined to brown,	–	4	11
28	Coal, II.	–	1	10
29	Blackiſh ſhale intermixed with coal,	–	2	6
30	Whitiſh freeſtone,	1	2	6
31	Strong bluiſh ſlate mixed with freeſtone,	–	3	–
32	White ironſtone,	–	1	–
33	Freeſtone ſtriated with blue ſlate,	–	1	8
34	White freeſtone in thin layers,	1	3	3
35	Dark-blue ſlate,	2	1	6
36	Coal, III.	–	–	9
37	Dark gray ſhale,	–	5	8
38	Coal, IV.	–	2	–
39	Gray freeſtone mixed with ironſtone,	1	2	–
40	Hard white freeſtone,	2	3	6
41	Coal, V.	–	1	–
42	Shale mixed with freeſtone,	1	2	–
43	Olive-coloured ſlate adhering to black ſlate ſuperincumbent on coal,	–	2	4
44	Coal, VI.	–	1	1
45	Black ſhale mixed with freeſtone,	1	2	8
46	White freeſtone mixed with ſlate,	1	2	–
47	Dark-blue ſlate,	3	4	4
48	Coal, VII.	–	1	3
49	Black ſhale mixed with freeſtone,	1	1	6
50	Strong white freeſtone,	1	–	–
51	Brown ironſtone,	–	3	–
52	Dark-gray ſlate,	1	–	–
53	Dark-gray ſhale with an intermixture of Coal, VIII.	–	5	6
54	Light-coloured ſlate mixed with freeſtone,	–	5	6
55	Blue ſlate ſtriated with freeſtone,	1	4	–
56	Strong white freeſtone a little tinged with iron.	–	2	6

N°	Stratum.	Fath.	Feet.	Inch.
57	Very black ſhivery ſlate,	1	4	3
58	Strong coal of a good quality, IX.	–	–	4
59	Soft gray ſlate,	–	–	3
60	Very black coal, X. burns well,	–	–	8
61	Hard black ſlate,	–	1	7
62	Coal mixed with pyrites, XI.	–	1	2
63	Argillaceous ſchiſtus, gray and brittle,	–	3	–
64	Blue rough argillaceous ſchiſtus,	–	4	6
65	Fine blue ſlate,	–	3	–
66	Freeſtone mixed with ironſtone,	–	3	–
67	Black ſhivery ſlate,	1	–	–
68	Dark-blue ſlate, very fine,	–	5	6
69	Dark-blue ſlate, very brittle,	–	–	6
70	Coal, XII.	–	2	6
71	Soft gray argillaceous ſchiſtus,	–	–	6
72	Argillaceous ſchiſtus mixed with freeſtone,	–	2	–
73	White freeſtone with fine particles,	1	1	–
74	Blue ſlate ſtriated with white freeſtone,	–	4	7
75	Light-blue ſlate,	–	3	–
76	Blue ſlate a little mixed with ironſtone,	2	–	–
77	Black ſhivery ſlate,	–	1	–
78	Coal, XIII.	–	–	6
79	Browniſh hard ſlate,	1	3	–
80	Strong blue ſlate tinged with ironſtone,	4	4	6
81	Dark-blue ſlate rather inclined to brown,	–	1	6
82	Black ſhivery ſlate,	–	–	6
83	Coal, XIV.	–	1	–
84	Lightiſh-gray, brittle ſoapy ſchiſtus,	–	4	–
85	Freeſtone ſtriated with blue ſlate,	1	1	–
86	Fine blue argillaceous ſchiſtus ſtriated with freeſtone,	–	4	–
87	Black ſlate, with hard, ſharp, and fine particles,	–	3	–
88	Very light blue ſlate, remarkably fine,	4	3	–
89	Coal, XV.	–	5	4
90	Soft gray argillaceous ſchiſtus,	–	4	3
91	Black ſhivery ſlate,	–	2	2
92	Coal, XVI.	–	1	3
93	Strong lightiſh-coloured ſhale,	–	3	4
94	Blue ſlate ſtriated with white freeſtone,	–	3	4
95	Ironſtone,	–	–	4
96	Gray ſlate,	–	3	9
97	Strong white freeſtone,	–	5	6
98	Freeſtone ſtriated with blue ſlate,	–	–	10
99	White freeſtone,	–	1	3
100	Freeſtone ſtriated with blue ſlate,	–	3	11
101	Black ſlate,	–	–	5
102	Freeſtone ſtriated with blue ſlate,	–	1	4½
103	Strong white freeſtone,	–	–	4
104	Freeſtone mixed with blue ſlate,	–	2	4
105	Strong white freeſtone,	–	–	5
106	Grayiſh ſlate of a ſhivery nature,	1	–	–
107	Freeſtone mixed with blue ſlate,	–	4	–
108	Very ſtrong white freeſtone.	–	5	3
109	Fine blue ſlate,	–	2	3
110	White freeſtone ſtriated with blue ſlate,	–	–	7½
111	Fine blue ſlate,	–	–	4
112	White freeſtone,	–	2	1
113	Freeſtone ſtriated with blue ſlate,	–	–	10
114	White freeſtone,	–	–	4
115	White freeſtone in thin layers,	–	–	5
116	Fine blue ſlate,	–	2	1
117	Coal, XVII.	1	1	10

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An interesting and valuable memoir on the subject of coal, written by M. Duhamel the younger, was presented a few years since to the Academy of Sciences at Paris, who adjudged it the prize that had been offered for the best essay on the subject. An ample abstract of this memoir appeared in the *Journal des Mines*, N° vii. In this paper is given a table of the number of veins, their direction and inclination, and the nature of the strata next the coal, and in the neighbourhood, in all the principal mines in Europe. For a fuller view of the natural history of coal, the readers may consult Dr Millar's edition of Williams's Mineral Kingdom, 1810.

Sect. XXXI. *Of Fossils and Petrifactions.*

109 Fossils.

Those organic remains of vegetable and animal matter which are found below the surface of the earth, mixed with the stony matters which are properly the component parts of the earth, are generally called *fossils*, or *extraneous fossils*. If they have entirely lost all traces of vegetable or animal matter, and have assumed a stony earthy nature, they are called *petrifactions*.

Some of these organic remains, particularly those of the vegetable kind, are found penetrated with a bituminous substance, so as to be rendered highly inflammable. One of the most curious circumstances attending these fossil bodies is, that they are very commonly natives of a different country from that in which they are found, or are the remains of species that are now no longer known.

We may properly divide these substances into those of the vegetable and those of the animal kingdom.

1. *Vegetable fossils.* Almost every part of vegetables, the trunks, branches, leaves, and fruits, have been found in a fossil state, or impressions of some of them are seen in various mineral substances, especially in the slaty stone which accompanies coal.

Fig. 6. represents a curious example of this, that was found in the mines at Saint Etienne in France.

A, is a fruit resembling that of coffee. B, is a portion of an unknown vegetable, apparently of the verticillate tribe. C, is a species of fern, which is very remarkable, as it is furnished with fructifications. D, is part of a plant with verticillate leaves, probably a species of *galium*. E, is some exotic fruit.

Whole trees are often found below the surface of the earth, especially in bogs and mosses, sometimes retaining much of their vegetable nature, but more commonly either impregnated with bitumen or completely petrified. Subterraneous trees are frequently dug up in the isle of Anglesea; and in the isle of Man there is a marsh six miles long and three broad, in which fir trees are found in great quantities; and though they are 18 or 20 feet below the surface, they appear as if standing firmly upon their roots. Subterraneous trees, in various states, are frequently found in Ireland, especially in the neighbourhood of Lough Neagh. Much has been written on the subject of these petrifactions of Lough Neagh, by Dr Boate, in his Natural History of Ireland; by Mr Molyneux, in the Philosophical Transactions, N° clviii. and Dr Barton in his Lectures on Natural Philosophy. Some of these trees are represented as of an immense size*. One of the most curious instances of vegetable fossils, is that related by Ramnazzini, as seen by him at Modena in Italy. At the bottom of wells, that are dug there below stony masses, which appear to have been the foundation of a former city, at the depth of near 30 feet, they find heaps of wheat entire, filbert trees, with their nuts, briars, &c. They find, likewise, every six feet, a layer of earth, alternating with branches and leaves of trees.

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At the depth of 28 feet, or thereabouts, they find a chalk that cuts very easily. It is mixed with shells of several sorts, and makes a bed of about 11 feet. After this they find a bed of marshy earth, of about two feet, mixed with rushes, leaves, and branches. After this bed comes another chalk bed, of nearly the same thickness with the former, which ends at the depth of 49 feet.

That is followed by another bed of marshy earth like the former; after which comes a new chalk bed; and these successive beds are always found in the same order. The auger sometimes finds great trees, which give the workmen much trouble. They see also sometimes at the bottom of these wells, great bones, coals, flints, and pieces of iron †.

These vegetable fossils are generally of a flinty structure, being sometimes rough and sandy; at others so hard and compact as to admit of a fine polish. Some beautiful specimens of petrified wood, of the appearance of agate, are to be seen in cabinets of natural history. That of Besson at Paris contains two examples of this kind, which are figured at fig. 7. and 8. Fig. 7. is a transverse section of a piece of agatized wood, in which the ligneous texture is most completely preserved. Fig. 8. is another more compact, and which has the additional singularity of containing several worms. The white oval spots are supposed to have been eggs, from which the worms had issued. In Dr Millar's Mineralogical Cabinet there is a similar specimen containing worms and their ova from Siberia, as well as many beautiful specimens of agatized wood from Siberia and Germany.

110 Povey coal.

Among the bituminous vegetable fossils, none have attracted more attention than what is called *bovey coal*, a substance of an intermediate nature between wood and pitcoal, which is dug up in a common near Chudleigh in Devonshire. It is of a laminated texture, of a chocolate, or sometimes of a shining black colour, like deal boards that had been half charred. It burns heavily, and consumes to light gray ashes. It is regularly stratified among beds of sand and clay, and the beds of coal are sometimes of considerable thickness. Mr Parkinson has collected much information respecting the former and present state of this coal, in his entertaining work on fossils ‡.

111 Animal fossils.

2. *Animal fossils.* Fossils of animal matters are still more common than those of vegetables. Shells and bones are found in almost every bed of limestone, and in almost every country, at the bottom of the deepest valleys, and at the tops of very considerable mountains.

In the limestone strata in Derbyshire are found many of those fossils, which are called *star-stones* and *screw-stones*, which appear to be the remains of marine animals called *encrini*. These are described by Whitehurst, who has given figures of similar animals brought entire from the West Indies §. Fig. 9. represents one of these stones.

The isle of Cherea in Dalmatia contains caverns in which are found prodigious quantities of fossil bones of oxen,

† *Ray's Discourses*, p. 223.

‡ *Organic Remains*, vol. i. Letter xii.

§ *Theory of the Earth*, chap. xvii.

* *Parkinson's Organic Remains*, Letter vii.

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oxen, horſes, and ſheep. Similar examples occur in many places; but human bones are, we believe, never found in a foſſil ſtate.

Foſſil ſhells are found on the Alps, on the top of Mount Cenis, on the Appennines, on the mountains of Genoa, and in moſt of the quarries of ſtone and marble in Italy; in moſt parts of Germany and Hungary, and indeed generally in all the elevated places in Europe. We alſo find them in the ſtones whereof the moſt ancient edifices of the Romans were conſtructed.

In Switzerland, Aſia, and Africa, travellers have obſerved petrified fiſh in many places; for inſtance, on the mountains of Caſtravan, there is a bed of white laminated ſtone, and each lamina contains a great number and diverſity of fiſhes; they are, for the moſt part, very flat, and extremely compreſſed, in the manner of foſſil fern; yet they are ſo well preſerved, that the minuteſt marks of their fins and ſcales are diſtinguiſhable, and every other part, whereby one ſpecies of fiſh is known from another.

There are likewiſe many *echenites* and petrified fiſh between Iver and Cairo, and on all the hills and heights of Barbary, moſt of which exactly correſpond with the like ſpecies taken in the Red ſea.

The long chain of mountains which extend from eaſt to weſt, from the lower part of Portugal to the moſt eaſtern parts of China, thoſe which ſtretch collaterally to the north and ſouth of them, together with the mountains of Africa and America, which are now known to us, all contain *ſtrata* of earth and ſtone, full of ſhells.

The iſlands of Europe, Aſia, and America, wherein Europeans have had occaſion to dig, whether in mountains or plains, all furniſh us with ſhells, and convince us that they have this particular in common with their adjacent continents.

The *gloſſopetra*, or the teeth of ſharks and other fiſhes, are found in the jaws, poliſhed and worn ſmooth at the extremities, conſequently muſt have been made uſe of during the animal's life; and in ſhells the very pearls are found, which the living animals of the ſame kind produce.

It is well known that the *purpura* and *pholades* have a long-pointed proboſcis, which ſerves them as a kind of gimblet or drill, to pierce the ſhells of living fiſh, on whoſe fleſh they feed. Now, ſhells thus pierced are found in the earth, which is another inconteſtable proof that they heretofore incloſed living fiſh, and that theſe fiſh inhabited places where the *purpura* and *pholades* preyed on them.

In Holland ſea ſhells are found 100 feet below the ſurface; at Marly-la-Ville, ſix leagues from Paris, at 75; and in the Alps and Pyrenean mountains they are found under beds of ſtone of 100, nay even 1000 feet.

Shells are likewiſe found in the mountains of Spain, France, and England, in all the marble quarries of Flanders, in the mountains of Guelders, in all the hills round Paris, in thoſe of Burgundy and Champagne; and, in ſhort, in all places where the baſis of the ſoil is neither freeſtone nor ſandſtone.

By ſhells we would be underſtood to mean, not only thoſe which are merely teſtaceous, but the relics of the cruſtaceous fiſhes alſo; and even all other marine productions; and we can venture to affert, that, in the generality of marbles, there is ſo great a quantity of marine productions, that they appear to ſurpaſs in bulk the matter whereby they are united.

Among the many inſtances of the multiplicity of oyſters, there are few more extraordinary than that immenſe bed which M. de Reaumur gives an account of, which contains 130,630,000 cubic fathoms. This vaſt maſs of marine bodies is in Touraine in France, at upwards of 36 leagues from the ſea. Some of theſe ſhells are found ſo entire, that their different ſpecies are very diſtinguiſhable.

Some of the ſame ſpecies are found recent on the coaſt of Poictou, and others are known to be natives of more diſtant parts of the world. Among them are likewiſe blended ſome fragments of the more ſtrong parts of ſea plants, ſuch as *madripores*, *fungi marini*, &c. The canton of Touraine contains full nine ſquare leagues in ſurface, and furniſhes theſe fragments of ſhells wherever you dig.

Near Reading in Berkſhire, a continued body of oyſter ſhells has been found: they lie in a ſtratum of greeniſh ſand, about two feet in thickneſs, and extend over five or ſix acres of ground; they are covered by ſtrata of ſand and clay, upwards of 14 feet deep. Several whole oyſters are found with both their valves or ſhells lying together, as oyſters before they are opened; the ſhells are very brittle; and in digging them up, one of the valves will frequently drop from its fellow. Several are dug out entire; nay, ſome double oyſters with their valves united.

In a quarry at the eaſt end of Broughton in Lincolnſhire, innumerable fragments of the ſhells of ſhell fiſh, of various ſorts, are found under a ſtratum of ſtone imbedded in clay, with pieces of coral, and ſometimes whole ſhell fiſh, with their natural ſhells and colours: ſome are moſt miſerably cracked, bruiſed, and broken; others totally ſqueezed flat by the incumbent weight of earth.

Sharks teeth are dug up in the iſle of Sheppey, retaining their natural colour, not petrified.

The teeth of ſharks have likewiſe been taken out of a rock in Henderſhelf park, near Malton in Yorkſhire.

In the iſle of Caldey, and elſewhere about Tenby in Pembrokeſhire, marine foſſils have been found in ſolid marble, on the face of the broken ſea cliffs, 200 fathoms below the upper ſurface of the rocks. Nor were they only obſerved upon the face of theſe rocks, but even more or leſs throughout the whole maſs or extent of them. This is manifeſt from divers rocks hewn down by workmen for making of lime, and other pieces caſually fallen from the cliffs.

Thouſands of foſſil teeth, exactly anſwering to thoſe of divers ſorts of ſea fiſh, have been found in quarries and gravel pits about Oxford.

At Tame in Oxfordſhire, the *belemnites*, or *thunderbolt ſtones*, are found in a ſtratum of blue clay, which ſtill retain their native ſhelly ſubſtance.

The *belemnites* found in gravel pits, have ſuffered much, by their being rubbed againſt each other in the fluctuation of waters.

The *nautili* and *belemnites* are frequently found at Gorſing near Oxford *.

One of the moſt extraordinary collections of ſhells is that

* *Phil. Tranſ.* vol. liv. p. 5.

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that lately diſcovered by Ramond on the ſummit of Mont Perdu, the higheſt of the Pyrences, where there are found vaſt quantities of ſea ſhells and other marine ſpoils, and even ſkeletons of animals in a foſſil ſtate.

Whole ſkeletons of very large animals have been diſcovered in a foſſil ſtate. Thoſe of elephants have been found buried in the plains of Siberia; and bones of the rhinoceros, the hippopotamus, and the tapir, have been found in other places. A very large ſkeleton, nearly complete, of an immenſe animal, ſimilar to the rhinoceros, is preſerved in the cabinet of Madrid. It was dug up at Paraguay in South America, at the depth of 100 feet, in a ſandy bed, on the banks of the river de la Plata. A deſcription and engraving of it are given by Cuvier, in the Annals of the National Muſeum, N° 29. It appears to be at leaſt 12 feet long, and the bones are of an immenſe ſize.

A prodigious quantity of foſſils, both of marine animals, and of quadrupeds, are found in the plaiſter hills of Montmartre near Paris. An account of theſe has lately appeared in ſeveral numbers of the Annals of the National Muſeum, by M. Lamarck, accompanied with the anatomical illuſtrations of Cuvier. Theſe papers are extremely curious, and contain engravings of moſt of the foſſils deſcribed, ſome of which are the remains of unknown animals. Our limits do not permit us to preſent our readers with even an abſtract of theſe accounts. We ſhall therefore ſelect only one example.

Fig. 10. repreſents a block of gypſum, on the ſurface of which is the ſkeleton of an animal reſembling a mouſe, or, according to Cuvier, one of the opoſſum tribe. The ſkeleton is nearly entire, and the head, the neck, the ſpine, the pelvis, one of the fore and hind legs, and part of the tail, are very diſtinct. There were two pieces of gypſum found together, which appear to have divided the ſkeleton between them. The animal ſeems to have been cruſhed or imbedded in his natural ſituation *.

General Diſtribution of the Materials of the Earth.

* *Ann. de Muſ. Nat.* N° xxix. p. 277.

We have now enumerated the principal materials that compoſe the external cruſt of our earth, and have mentioned ſome of the moſt material circumſtances reſpecting each. The metallic ores ſtill remain to be conſidered, and they ſhall be noticed in deſcribing metallic veins.

Chap. II. *General Diſtribution of the Materials of the Earth.*

The uppermoſt ſtratum of the earth, in low ſituations, is, for the moſt part, compoſed of ſand or clay, or a mixture of theſe, forming beds that are either compoſed of the ſame mixture, or of alternate layers of the two ſubſtances. Theſe beds vary in thickneſs, in different places; but, in the ſame place, they uſually preſerve nearly the ſame thickneſs for a conſiderable extent. Sometimes theſe beds of clay, ſand, and earth, with ſhells, extend to the depth of ſome hundred feet. See the annexed table, 1. (E).

This table exhibits a view of the arrangement of ſtrata in ſeveral countries of Europe; and, with the tables of coal ſtrata, in the laſt chapter, will give the reader more information on this ſubject than an elaborate detailed account.

(E) The following works are referred to in the table of ſtrata.

* Varenii Geogr. Gener. lib. i. prop. vii.
† Buffon, Nat. Hiſt. vol. i. art. vii.
‡ Bergman, Deſcript. Phyſ. de Terre, ſect. viii.
‖ Kirwan, Geolog. Eſſays, p. 259.
§ Guettard, Atlas Mineral. de la France.
¶ Whitehurſt's Theory of the Earth, ſect. xvi.
** Ib. ſect. xix.

TABLE of the order of Strata in Various Parts of Europe.

N° of Strata.	1 * Strata at Amsterdam. Feet.	2 † At Marly la Ville, France. Ft. In.	3 ‡ Gravesend in Kent. Ft. In.	4 ‖ Mansfield in Germany. Ft. In.	5 § Hills near Etampes in France. Ft. In.	6 ¶ Strata of Derbyshire. Ft. In.	7 ** At Balleycastle, Ireland. Ft. In.
1	Soil, 7	Earth, mud & sand, 13 0	Sand and flints, 1 3	Vegetable earth,	Vegetable earth, 4 0	Coarse sandstone, 360 0	Whinstone,
2	Turf, 9	Earth and gravel, 2 6	Red sand, 0 10	Swinestone, 36 0	Marl and turf cut by dykes, 135 0	Slate clay, 360 0	Firestone,
3	Soft clay, 9	Mud and sand 3 0	Sand and flints, 1 8	Gypsum, 24—180 0	Of freestone, marl, and shells, 12 0	Shelly limestone, 150 0	Shale,
4	Sand, 8	Hard marl, 2 0	Red sand, 0 10	Clay, chalk, and sand, 72—120 0	Brown pebbles, 4 0	Amygdaloid, 48 0	Stony clay,
5	Earth, 4	Marly stone, 4 0	Sand and flints, 2 6	Compact limestone, 12 0	Marl and shells, 0 6	Compact limestone, 150 0	Shale,
6	Clay, 10	Powdery marl with sand, 5 0	Pure sand in beds, 1 8	Argilliferous limestone, 3 0	Sand and grit, 45 0	Amygdaloid 138 0	Freestone,
7	Earth, 4	Sand, 1 6	Blackish clay, 0 4	Indurated clay, 0 1	Sand and rounded pebbles, 18 0	Lamellar limestone, 180 0	Stony clay,
8	Sand, 10	Marl and sand, 3 6	Chalk and flints, 1 0	Calciferous clay, 4 6	Sand and shells, 6 0	Amygdaloid, 66 0	Shale,
9	Clay, 2	Hard marl and flint, 3 6	Clay, sand, flints, and shells, 1 3	Clay slate, 1 4	Sand & gravel, 16 0	Limestone not cut through,	Limestone,
10	White sand, 4	Gravel or marl in powder, 1 0	Fine yellow sand, 4 4	Marlite, 1 0	Tuf and shells, 4 0	. . .	Coal,
11	Earth, 6	Eglantine, 1 6	. . .	Sand, 0 1	Soft shale, 4 0	. . .	Indurated clay,
12	Sand, 14	Marly gravel, 1 6	. . .	Gravel, 3 0	Marly clay, 8 0	. . .	Stony clay,
13	Clay and sand, 8	Stony marl, 4 6	. . .	Blue clay, 2 in. to 8	. . .	. . .	Not ascertained,
14	Sand & shells, 4	Sand and shells, 1 6	. . .	Sandstone, clay, & mica, 6 0	. . .	. . .	Coarse sandstone, See fig. 1.
15	Clay, 102	Gravel, 2 0	. . .	Red semiprotolite, 360 0			
16	Sand, 31	Stony marl, 3 6	. . .	Siliceous sandstone, 96 0			
17	. .	Powder marl, 1 6	. . .	Cragg-stone, 10 6			
18	. .	Hard stone, 1 0	. . .	Wacken, 156 0			
19	. .	Sand and shells, 18 6	. . .	Clay slate, 4 6			
20	. .	Brown freestone, 3 0	. . .	Coal, 4 6			
21	. .	Sand, 22 6	. . .	Clay slate, 3 0			
22				Slaty trap, 90 0			
23				Red semiprotolite, 180 0			
24				Primitive rock, 0 0			
Total N° of Feet.	232	100 0	15 0		256 6		

General Distribution of the Materials of the Earth.

In our subsequent view of the distribution of the stony matters that compose the earth, we shall consider,

1. The nature, disposition, and structure, of mountains.
2. The nature, direction, &c. of dykes.
3. The nature, direction, &c. of metallic veins.

Sect. I. *Of Mountains.*

112 Definition of mountains.

There are no objects on the surface of the earth which are so well calculated to excite the attention of mankind in general, and that of geologists in particular, as those stupendous elevated masses which we call *mountains*. The term mountain has in general been applied to those parts of the earth which are elevated to a very considerable height above the level surface; and a mountain is in common language distinguished from a hill only by its superior elevation. But as it is found necessary in a scientific point of view to render this distinction more accurate and precise, various geologists have given more correct definitions. By Pini and Mitterpachter every elevation whose declivity makes with the horizon an angle of at least 13°, and whose perpendicular height is not less than one-fifth of the declivity, is called a *mountain*. Werner distinguishes mountains according to their height, into *high*, *middle-sized*, and *low*. A *high* mountain according to him is that whose perpendicular height exceeds 6000 feet; when the height is not above 6000 nor below 3000 he calls it *middle-sized*; and when its height is below 3000 feet, he calls it *low*.

113 Mountains are either single or in groups; and these groups either consist of several mountains standing near each other so as to occupy nearly the centre of a certain space of ground, or they follow each other so as to form a ridge or chain, running across a country, or along its shores. Sometimes these chains run in a longitudinal direction, as is the case with Mount Caucasus and the Uralian mountains in Asia, the Cordilleras in South America, &c. but often they run in a curvilineal direction like a crescent, as the Carpathian mountains, which separate Hungary from the rest of the Austrian territories. It has been supposed by some theoretic writers, that chains of mountains always run in nearly the same direction, which has been conceived to be from east to west; but this is by no means exact, as later observations have shewn that they assume different directions according to the form of the country where they are situated. Some writers have laid it down as a general rule, that chains of mountains always extend in a direction nearly parallel to the length of the country; but to this there are also many exceptions. Thus the Uralian mountains, the Carpathians, the Pyrenees, the Grampians in Scotland, and many others, run rather across the country. It often happens that mountains occupy nearly the central parts of a country; and the land generally slopes with a gentle declivity towards one side of the chain, while towards the other it is considerably steeper. This circumstance of one side of a chain of mountains being steeper than the other, has been lately extended to mountains and hills in general; and Dr Kirwan has written an excellent paper on the subject, from which we shall here extract the most important observations.

General Distribution of the Materials of the Earth.

114 Kirwan's observations on the declivities of mountains.

"That one part of almost every high mountain or hill is steeper than another, could not have escaped the notice of any person who had traversed such mountains; but that nature in the formation of such declivities had any regard to different aspects or points of the compass, seems to have been first remarked by the celebrated Swedish geologist Mr Tilas, in the 22d vol. of the Memoirs of Stockholm for 1760. Neither Varenius, Lulolph, nor Buffon in his natural history published in 1748, have noticed this remarkable circumstance.

115 The steep side faces the low country.

"The observation of Tilas, however, relates only to the extreme ends, and not to the flanks of mountains; with respect to the former, he remarked that the *steepest* declivity always faces that part of the country where the land lies lowest; and the gentlest, that part of the country where the land lies highest: and that in the southern and eastern parts of Sweden they consequently face the east and south-east; and in the northern the west. The essential part of this observation extends therefore only to the general elevation or depression of the country, and not to the bearings of their declivities.

116 Western side the steepest.

"The discovery that the different declivities of the flanks of mountains bear an invariable relation to their different aspects, seems to have been first published by Mr Bergman in his Physical Description of the Earth, of which the second edition appeared in 1773. He there remarked, that in mountains that extend from north to south, the western flank is the *steepest*, and the eastern the *gentlest*. And that in mountains which run east and west the southern declivity is the steepest, and the northern the gentlest. Vol. II. § 187.

"This assertion he grounds on the observations related in his 1st vol. § 32. namely, that in Scandinavia, the Suevoberg mountains that run north and south, separating Sweden from Norway, the western or Norwegian sides are the steepest, and the eastern or Swedish, the most moderate; the verticality or steepness of the former being to that of the latter as 40 or 50 to 4 or 2.

"That the Alps are steeper on their western and southern sides than on the eastern and northern.

"That in America the Cordilleras are steeper on the western side, which faces the Pacific ocean, than on the eastern. But he does not notice a few exceptions to this rule in particular cases which will hereafter be mentioned.

116 Remarks of Buffon.

"Buffon, in the first volume of his Epochs of Nature, published in 1778, p. 185. is the next who notices the general prevalence of this phenomenon, as far as relates to the eastern and western sides of the mountains that extend from north to south; but he is silent with respect to the north and south sides of the mountains that run from east to west; nay, he does not seem to have had a just comprehension of this phenomenon; for he considers it conjointly with the general dip of the regions in which these mountains exist. Thus he tells us, vol. i. p. 185, that in all continents the general declivity, taking it from the summit of mountains, is always more rapid on the western than on the eastern side; thus the summit of the chain of the Cordilleras is much nearer to the western shore than to the eastern; the chain which divides the whole length of Africa, from the Cape of Good Hope, to the mountains of the Moon,

General Distribution of the Materials of the Earth.

Moon, is nearer, he says, to the western than to the eastern seas; of this, however, he must have been ignorant, as that tract of country is still unknown.

"The mountains which run from Cape Comorin through the peninsula of India are, he says, much nearer to the sea on the east than on the west; he probably meant the contrary, as the fact is evidently so, and so he states it in vol. ii. p. 295.; the same he tells us may be observed in islands and peninsulas, and in mountains.

"This remarkable circumstance of mountains was notwithstanding so little noticed, that in 1792 the author of an excellent account of the territory of Carlsbad in Bohemia, tells us he had made an observation, which he had never met with in any physical description of the earth, namely, that the southern declivity of all mountains was much steeper than the northern, which he proves by instancing the Erzgebirge of Saxony, the Pyrenees, the mountains of Switzerland, Savoy, Carinthia, Tyrole, Moravia, the Carpathian and Mount Hæmus in Turkey. 2. *Bergm. Jour.* 1792. p. 385. in the note.

118 Of Herman.

"Herman in his geology, published in 1787, p. 90. has at least partially mentioned this circumstance; for he says that the eastern declivities of all mountains are much gentler and more thickly covered with secondary strata, and to a greater height than the western flanks, which he instances in the Swedish and Norwegian mountains, the Alps, the Caucasian, the Appenine, and Ouralian mountains; but the declivities bearing a southern or northern aspect he does not mention.

119 Of Delametherie.

"Lametherie, in vol. iv. of his Theory of the Earth, of which the second edition appeared in 1797, a work which abounds in excellent observations, p. 381. produces numerous instances of the inequality of the eastern and western declivities, but scarce any of the northern and southern, whose difference he does not seem to have noticed; but he makes a remark which I have not seen elsewhere, that the coasts of different countries present similar declivities.

"With regard to eastern and western aspects, he thinks that a different law has obtained in Africa from that which has been observed in other countries; for in that vast peninsula he imagines the eastern declivities of mountains are the steepest, and the western the gentlest. Of this, however, he adduces no other proof, but that the greatest rivers are found on the western side: this proof seems insufficient, as, if mountains be situated far inland, great rivers may flow indiscriminately from any side of them, and sometimes few rivers flow even from the side whose descent is most moderate; for instance, from the eastern side of the mountains of Syria. The Elbe and the Oder, two of the greatest rivers in Germany, take their course from the western sides, the first of the Bohemian and the other of the Moravian mountains, which yet are the steepest. Many originate from lakes, as the Shannon with us; many take such a winding course, that from a bare knowledge of the place of their disemboguement it is impossible to judge from what side of a mountain they issue, if from any; their course at most discovers the depression of the general level of the country.

"In 1798, the celebrated traveller and circumnavigator, John Reinhold Forster, published a geological tract which merits so much more attention, as all the facts were either observed by himself, or related to him by the immediate observers. In this he states as a fact universally observed, that the south and south-east sides of almost every mountain are steep, but that the north and north-west sides are gently covered and connected with secondary strata, in which organic remains abound, which he illustrates by various instances, some of which have been already, and others will presently be mentioned.

General Distribution of the Materials of the Earth.

120 South and south-east sides of mountains steepest.

"At present this fact attracts the greatest attention, being obviously connected with the original structure of the globe, and clearly proving that mountains are not merely fortuitous eruptions unconnected with transactions on the surface of the earth, as has of late been confidently advanced.

121 Account of mountains.

"I shall now state the principal observations relative to this object, that have been made in different parts of the world.

In Europe.

122 In Europe.

1. The mountains that separate Sweden from Norway extend from north to south, their western sides are *steep*, and the eastern *gentle*. 1. *Berg. Erde Beschreib.* p. 157.

2. The Carpathian mountains run from east to west; their southern sides towards Hungary are steep, their northern towards Poland moderate. *Forster*, § 46.

3. Dr Walker, professor of natural history at Edinburgh, observed that the coasts and hills of Scotland are steeper and higher on the western side than on the eastern. Jameson's Mineralogy of Scotland, p. 3. However, Jameson observed, that the south side of the isle of Arran is the lowest, and the north side the highest, p. 51.

4. The mountains of Wales are gentle on the eastern and steep on the western side.

5. The mountains of Parthery, in the county of Mayo, are steep on the western side.

6. The mountains which separate Saxony from Bohemia, descend gently on the Saxon or northern side, but are steep on the Bohemian or southern side. *Charpente*, p. 75. The southern declivity is to the northern as six to two. *Bergm. Journ.* 1792, p. 384. and 385.

7. The mountains which separate Silesia from Bohemia run nearly from east to west, yet are steeper on the northern or Silesian side than on the opposite Bohemian. *Assemanni Silesia*, 335. Such branches as run from north-east to south-west, have their western covered with primordial strata, and consequently less steep. 4. *New Roz.* p. 157.

8. The Meissener in Hessia is steeper on the north and east sides, which face the Warra, than on the south and western 1. *Bergm. Journ.* 1789, p. 272.

9. The mountains of the Hartz and Habichtswald are steep on the south, and gentle on the northern sides. *Forster*, § 46.

10. The Pyrenees, which run from east to west, are steeper on the southern or Spanish side. *Carbonieres*, xiii.

11. The mountains of Crim Tartary are gentle on the northern, and steep on the southern sides. *Forster*, ibid.

In

General Distribution of the Materials of the Earth.

123 In Asia.

In Asia.

12. The Ourals, which ſtretch from north to ſouth, are far ſteeper on the weſtern than on the ſouthern ſides. *Herman Geologie*, p. 90.; and, 2. *Ural. Beſchreib*, p. 389.

13. The mountain of Armenia, to the weſt of the Ourals, is ſteep on its eaſt and north ſides; but gentle on the ſouthern and weſtern. 1. *Pallas Voy.* p. 277.

14. The Altaiſchan mountains are ſteep on their ſouthern and weſtern ſides, but gentle on the northern and eaſtern. *Foſter*, ibid. and *Herman*. 2. *Ural Beſchreib*, p. 390. in the note.

15. So alſo are the mountains of Caucaſus. 3. *Schrift. Berl. Gelaſch.* 471.

16. The mountains of Kamtſchatka are ſteep on the eaſtern ſides. *Pallas*, 1. *Act. Petropol.* 1777. p. 43.

17. The Ghauts in the Indian peninſula are ſteep on the weſtern ſide.

18. The mountains of Syria, which run from north to ſouth, ſkirting the Mediterranean, are ſaid to be ſteeper on the weſtern ſide, facing the Mediterranean. 4. *La Metherie*, p. 380.

In America.

124 In America.

"The Cordilleras run from north to ſouth; their weſtern flanks towards the Pacific are ſteep, their eaſtern deſcend gradually.

"In Guiana there is a chain of mountains that run from eaſt to weſt; their ſouthern flanks are ſteep, their northern gentle. *Voyages de Condamine*, p. 140."*.

The theory according to which Mr Kirwan attempts to explain the appearances of mountains which are enumerated above, will be given in the next chapter.

We have already, under the article BAROMETER, N° 44. ſhewn the method of computing the height of mountains by means of that inſtrument. The following table ſhews the height of the principal mountains in the globe, chiefly according to this computation.

125 Height of mountains.

In this table the ſecond column ſhews the height as eſtimated by the barometer, and the third the ſame by geometrical calculation. Where the numbers are placed in the middle of theſe two ſpaces, it denotes an uncertainty by what method the computation has been made.

* *Nicolſ. Journ.* 8vo. vol. iv. p. 256.

TABLE of the Heights of Mountains, according to the lateſt computations.

Mountains.	Height by Barom.	Height by Geometry.
	Feet.	Feet.
In Britain.		
Ben Nevis,	4350	
Whirn,	4050	
	4015	
Ben Lawers,	3987	
Ingleborough,	2377	2380
Do.	3903	
Ben More,	3930	
Pennygent,	3839	
Croſsfell,	3380	3530
Skiddaw,	3456	
Snowden,	3465	
Mount Battock,	3411	
Pendlehill,	3564	
Schehallion,	3324	
Helvellyn,	3300	
Hartfell,	3700	
Ben Wevis,	3240	
Ben Lomond,	3048	
Saddleback,	3099	
Ben Ledy,		
In Ireland.		
Slieve Donard,	3150	
Croagh Patriek,	2666	
Nephin,	2640	
Knoek Meledown,	2700	
Mangerton,		2500
Cumeragh,	2160	
In France.		
Puy de Sanſi,	6300	
Plomb de Cantal,	6200	
Puy de Dome,	5000	

Mountains.	Height by Barom.	Height by Geometry.
	Feet.	Feet.
Pyrenees.		
Mont Perdu,	11,000	
Canigou,	9,000	
Alps.		
Mont Blanc,	15,662	
Schrekhorn,		13,000+
Finſteraar,		12,000+
Mount Titlis,		10,818
Mont Roſa,		15,000
Mont Cenis,		9,760
In the Tyrole.		
Glochner,		11,500 Fr.
Ortele,		13,000 Fr.
Plaley Kogel,		9,748 Fr.
Germany.		
Stuben,		4692
Brenner,		5109
Lomnitz peak, } Carpath.		8640
Keſmark peak, } Carpath.		8508
Krivan, } Carpath.		8343
Sicily.		
Ætna,		10,032
In Denmark, Norway, and Sweden.		
Swukku,		9000
Areſkutan,		6162
Kinneculla,		931
Rœtack,		6000

TABLE

General Distribution of the Materials of the Earth.

TABLE of the Heights of Mountains, Continued.

Mountains.	Height by Barom.	Height by Geometry	Mountains.	Height by Barom.	Height by Geometry.
In Ruſſia.	Feet.	Feet.	*South America.*	Feet.	Feet.
Pauda,		4512	Chimborazo,		20,280
			Do.	20,910	
Canary Iſlands.			Cotopaxi,		18,600
Peak of Teneriffe,	11,424		Tunguragas,	16,170	
In North America.			*In Jamaica.*		
Stony Mountains,	3000		Blue Mountains.	7431	
White Mountains,	4000				
Blue Mountains,	2000				

126 Courſe of mountains.

The courſe of mountains is that direction of their length in which they deſcend and grow lower; or if a river runs parallel to them, they are ſaid to have their courſe in the direction of the ſtream of the river. The courſe of mountains is ſeldom uniform. It has been laid down as a general maxim by Buffon, that when there are two parallel chains of mountains, the ſalient angle of one of the chains always correſponds with the internal angle of the other; but later geologiſts have aſcertained that this circumſtance does not generally hold, except when a river runs between the two chains.

127 Compoſition of mountains.

It generally happens, that one particular mountain, or chain of mountains is compoſed of thoſe ſtony materials which we have denominated primitive; while the reſt is made up of the ſecondary compounds. The primitive ſubſtances occupy the baſe and central parts of the mountain, and often extend to its very ſummit: the ſecondary cover theſe, and are generally found on the flanks or ſides of the mountain, though ſometimes they cover the top of the mountain. In a chain of mountains there are commonly three, and often five parallel ridges, of which the central ridge is compoſed of primitive compounds, and thoſe on each ſide of it, chiefly or entirely of ſecondary compounds. Hence mountains are uſually divided into primary or primeval, and ſecondary or epizootic; the latter term being given to the ſecondary mountains from their being replete with ſhells and other remains of animal beings. The ſecondary mountains are alſo ſometimes divided into original and derivative, for a reaſon that will appear hereafter.

128 Diſtinction of primary and ſecondary mountains.

The primary mountains, beſides their being in the centre, and deſtitute, or nearly ſo, of organic remains, may generally be diſtinguiſhed by the ruggedneſs and angular appearances ariſing from the different nature and hardneſs of the ſubſtances of which they are compoſed; the quartz and harder granite reſiſting the attacks of the air and weather, while the other ſubſtances being ſofter, gradually decay, and leave the harder in the form of ſpires and angles. Where, however, the primitive compounds have been completely covered with ſecondary ſtrata, theſe angular appearances ſeldom take place; and the mountain is only to be diſtinguiſhed by its poſition and the ſtructure of its internal parts. The ſecondary mountains generally have their tops round, and much ſmoother than thoſe of the primary mountains.

In ſome caſes a number of mountains appear united at their tops into an extenſive plain or platform, from which they ſeem to diverge and branch in every direction. The moſt remarkable inſtance of this kind occurs in Tibet. (See GEOGRAPHY, N° 41.).

It is difficult to acquire a knowledge of the interior ſtructure of mountains. The greater part of them is hid from our view, and nature only expoſes them in a few points by means of fiſſures, caverns, and intermediate valleys.

"The materials of which mountains conſiſt are diſpoſed either in irregular heaps, or piles variouſly interſected by rifts, or in beds or ſtrata ſeparated from each other by rifts, often horizontal, or varying from that direction by an angle of from 5 to 40 degrees, and ſometimes much more conſiderably, approaching even to a vertical poſition. The ſtrata of mountains are moſt frequently in the direction of their declivity, yet ſometimes their courſe is directly oppoſite, or countercurrent: the beſt manner of determining the angles of their courſe is by diſcovering that of their rifts. It chiefly depends on the unevenneſs of the fundamental ground that ſupports them. According to 1 Sauſſ. 502. moſt of the elevated granitic mountains in Swiſſerland are formed of immenſe vertical pyramidal laminæ, parallel to each other, that is, piles ſomewhat inclining from the unequal diſtribution of their weight, a diſpoſition that may well be expected from collateral cryſtallizations; but this diſpoſition is not univerſal, for they have been found in Saxony, and in the Pyrenees, horizontally ſtratified; much leſs can it be ſaid, that this vertical poſition is general, for the ſtrata of gneiſs are generally horizontal, and commonly very regular diſcovering no traces of a violent ſhock. Mount Roſa, next to Mount Blanc, the higheſt in Europe, conſiſts alſo of gneiſs, which M. Sauſſure found horizontally ſtratified.

"Shangin, who lately (1786) travelled over the Altaiſchan mountains, being conſulted by Pallas, whether he found any vertical layers or ſtrata therein, anſwered, he had not; but that he found them perfectly horizontal on the banks of the river Tſchary.

"Mountains of primitive limeſtone are frequently in irregular piles, but often alſo horizontally ſtratified. Siliceous ſchiſtus is alſo often horizontally ſtratified.

General Diſtribution of the Materials of the Earth.

Many argillites, particularly roof ſlates, are generally ſaid to have nearly a vertical poſition: but Voight has ſhewn that it is only their lamellæ that are ſo ſituated; their horizontal ſeams, and their walls, diſcovering their true poſition; their verticality ariſing only from the drain of the water, and, conſequently, their contraction in that direction: hence thoſe that are moſt ſilicited, as they contract leſs, diſcover leſs verticality. Sometimes horizontal ſtrata overlap on both ſides. Sometimes they are flanked on both ſides with vertical ſtrata.

"Much confuſion prevails in the ſtructure of the Pyrenees, and of the Griſon mountains, and thoſe on the borders of the Baikal, and other great lakes.

"The perturbed ſtate of the ſtrata often proceeds from the decompoſition of internal beds of pyrites, to which water has had acceſs; this appears to be the cauſe of the alterations obſerved in the mountain of Rabenberg, on the frontiers of Saxony. In this mountain a double direction of the ſtrata of gneiſs is obſerved; between both the ſtrata are vertical, and a large intermediate ſpace is filled with iron ore: but this mountain contains beds of pyrites and vaſt ſwallows; moſt probably then the pyrites ſwoll, uplifted the whole, and the diſſolved iron flowed into the vacuity, from which the water afterwards drained off on the ſides.

"In ſecondary mountains, particularly the calcareous, the greateſt diſorder often prevails, though in general their ſtratification is horizontal.

"The calcareous mountains of Savoy are often arched like a *lambda*, probably from the ſinking of the intermediate ſtrata, the intermediate remaining horizontal. Sometimes they aſſume the form of the letters Z. S. C. or of a diſjointed ↄC, the convexities facing each other. So alſo in the Pyrenees, they ſometimes overlap, from an unequal diſtribution in their original formation, and bend various ways. They aſſume a ſpiral form, or that of a horſe-ſhoe placed horizontally.

"According to Lehman, moſt ſecondary ſtrata preſent hollows or *moulds*, (as they are called,) from internal depreſſion. But ſometimes alſo *elevations*, from an original elevation in the fundamental ſtone.

"In Scotland, all the ſecondary ſtrata in the vicinity of primeval mountains, are nearly vertical; but at a greater diſtance they approach more to an horizontal direction *."

* *Kirwan's Geological Eſſays*, p. 281.

129 Equatorial mountains not the higheſt.

We ſhall now trace the courſe of the principal mountainous chains on the globe, and in accompanying us, the reader may have before him a good map of the world.

M. Buache places the moſt elevated points of the great chains of mountains under the equatorial line: but, according to Pallas, the fulleſt and moſt continuous lands, and perhaps likewiſe the moſt elevated, are to be found at a diſtance from the equator, and towards the temperate zones. If, in fact, we ſurvey the globe's ſurface, we ſhall not be able to perceive that chain of mountains, which running from eaſt to weſt, and dividing the earth into two portions, ought again to meet. On the contrary, extenſive plains ſeem to accompany the line through almoſt its whole extent. In Africa, the deſerts of Nigritia and thoſe of Upper Ethiopia are on the one ſide of the line; and on the other are the ſandy plains of Nicoco, Caffraria, Monemugi, and Zanguebar. From the eaſtern ſhores of Africa to the Sunda iſlands, is a ſpace of 1500 leagues of ſea with almoſt no iſlands, except the Laccadive and Maldive iſlands; moſt part of which have little elevation, and which run from north to ſouth. From the Molucca iſlands and New Guinea, to the weſtern borders of America, the ſea occupies a ſpace of 3000 leagues. Though Chimboraço and Pichincha in America, the two higheſt mountains which have been meaſured, are near and even under the line, yet from this no concluſion can be drawn; becauſe on one ſide theſe mountains run in a direction not parallel to the equator; the Andes or Cordilleras attain a greater elevation as they remove from the equator towards the poles; and a vaſt plain is found exactly under the line, between the Oroonoko and the river of the Amazons. Beſides, the latter river, which takes its riſe in the province of Lima about the 11th degree of ſouth latitude, after croſſing the whole of South America from weſt to eaſt, falls into the ocean exactly under the equator. This ſhows that there is a deſcent for the ſpace of 12 degrees or 300 leagues. From the mouth of the river of the Amazons, to the weſtern ſhores of Africa, the ſea forms another plain of more than 50 degrees.

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From the few certain facts and accurate obſervations which we have received from well informed travellers, we might almoſt affirm that the moſt elevated land on our globe is ſituated without the tropics in the northern and ſouthern hemiſpheres. By examining the courſe of the great rivers, we in fact find that they are in general diſcharged into three great reſervoirs, the one under the line, and the other two towards the poles. This, however, we do not mean to lay down as univerſally true; for it is allowed, that, beſides the two elevated belts, the whole ſurface of the earth is covered with innumerable mountains, either detached from one another or in a continued chain. In America, the Oroonoko and the river of the Amazons run towards the line, while the river St Lawrence runs towards the 50th degree of north latitude, and the river de la Plata towards the 40th degree of ſouth latitude. We are ſtill too little acquainted with Africa, which is almoſt all contained within the tropics, to form any accurate concluſions concerning this ſubject. Europe and Aſia, which form only one great maſs, appear to be divided by a more elevated belt, which extends from the moſt weſterly ſhores of France to the moſt eaſterly of China, and to the iſland of Sagaleen or Anga-hata, following pretty nearly the 50th degree of north latitude. In the new continent, therefore, we may conſider that chain where the Miſſiſſippi, the river St Lawrence, the Ohio, and the river de los Eſtrechos, take their riſe, as the moſt elevated ſituation in North America; whence the Miſſiſſippi flows towards the equator, the river St Lawrence towards the north-eaſt, and the reſt towards the north-weſt. In the old continent, the belt formerly mentioned, and to which we may aſſign about 10 degrees of breadth, may be reckoned from the 45th to the 55th degree of north latitude: for in Europe the Tagus, the Danube, the Dnieper, the Don and the Volga, and in Aſia the Indus, the Ganges, the Meran, the Mecon, the Hoang-ho, and the Yang-tſe-Kiang, deſcending as it were from this elevation, fall into the great reſervoir between the tropics; whilſt towards the

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north the Rhine, the Elbe, the Oder, the Viſtula, the Oby, the Jeniſei, the Lena, the Indigirka, and the Kowyma, are diſcharged into the northern reſervoir.

Judging from thoſe mountains the height of which has been calculated, and from the immenſe chains with which we are acquainted, we may infer that the higheſt mountains are to be found in this elevated belt. The Alps of Swiſſerland and Savoy extend through the 45th, the 46th, and the 47th degrees. Among them we find St Gothard, Furca, Bruning, Ruſs, Whiggis, Scheidek, Gunggels, Galanda, and laſtly, that branch of the Swiſs Alps which reaches Tirol by the name of Arlenberg and Arula. In Savoy, we meet with Mont Blanc, the Peak of Argentiere, Cornero, Great and Little St Bernard, Great and Little Cenis, Coupcline, Servin, and that branch of the Savoyard Alps which proceeds towards Italy through the duchy of Aoſt and Montferrat. In this vaſt heap of elevated peaks, Mont Blanc and St Gothard are particularly diſtinguiſhed. The Alps, leaving Swiſſerland and Savoy, and paſſing through Tirol and Carniola, traverſe Saltzbourg, Stiria, and Auſtria, and extend their branches through Moravia and Bohemia, as far as Poland and Pruſſia.—Between the 47th and 48th degrees, we meet with Grimming the higheſt mountain of Stiria, and Priel which is the higheſt in Auſtria. Between the 46th and 47th degrees, the Bacher and the Reinſchnicken, form two remarkable chains. The upper one, which traverſes the counties of Trenceſin, Arrava, Scepus, and the Kreyna, ſeparates Upper Hungary from Sileſia, Little Poland, and Red Ruſſia; the inferior one traverſes Upper Croatia, Boſnia, Servia, and Tranſylvania, ſeparates Lower Hungary from Turkey in Europe, and meets the upper chain behind Moldavia, on the confines of Little Tartary. In theſe mountains are ſituated the rich mines of Schemnitz.

To form a general idea of the great height of this Alpine belt, it is neceſſary only to remark, that the greateſt depth of the wells at Schemnitz is 200 toiſes; and yet it appears, from the barometrical calculations of the learned M. Noda, that the greateſt depth of theſe mines is 286 toiſes higher than the city of Vienna. The granito-argillous mountains of Schemnitz, and of the whole of this metallic diſtrict, are inferior, however, to the Carpathian mountains. Mount Krivany in the county of Arrava, and the Carpathian mountains between Red Ruſſia and the Kreyna, appear by their great elevation to rule over the whole of the upper Alpine chain. In the inferior chain we likewiſe meet with mountains of an extraordinary height; among others, Mount Mediednik, which gives its name to a chain extending far into Boſnia; and Mount Hemus, celebrated even among the ancients. In ſhort, this extenſive chain reaches into Aſia, and is there confounded with another chain no leſs famous, which, following exactly the 50th degree of latitude, runs through the whole of Aſia. This chain of mountains is deſcribed by Dr Pallas in the work above mentioned; and we ſhall now trace its courſe in company with this intelligent obſerver.

131 Uralian chain.

This author places the head of the mountains of Oural, between the ſources of the Yaik and the Bielaïa, about the 53d degree of latitude, and the 47th of longitude. Here the European Alps, after having traverſed Europe, and ſent off various branches which we ſhall afterwards examine, loſe their name, which is changed into that of the Ouralic or Uralian mountains, and begin their courſe in Aſia. This lofty chain, which ſeparates Great Bulgaria from the deſerts of Iſchimſka, proceeds through the country of the Eleuths, follows the courſe of the river Irtis, approaches the lake Teleſkaia, and afterwards forms a part of the ſame ſyſtem of mountains with the Altaic chain. There they give riſe to the Oby, the Irtis, and the Jeniſei, which begin their courſe about the 50th degree of north latitude, and fall into the Frozen ocean.

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132 Altaic chain.

The Altaic chain, after having embraced and united all the rivers which ſupply the Jeniſei, is continued under the name of *Saianes*, without the ſmalleſt interruption, as far as the Baikal lake. The extenſion of this chain to the ſouth forms that immenſe and elevated plain which is loſt in Chineſe Tartary, which may be compared with the only plain in Quito, and which is called *Gobi* or *Chamo*. The Altai afterwards interpoſing between the ſource of the Tchikoi and of the rivers which ſupply the Amur or Sagaleen, riſes towards the Lena, approaches the city Jakuck beyond the 60th degree of latitude, runs from that to the ſea of Kamtſchatka, turns round the Ochockoi and Penſink gulfs, joins the great marine chain of the Kurile iſles near Japan, and forms the ſteep ſhores of Kamtſchatka, between the 55th and 60th degrees of latitude. After running in the ſame parallel, and giving riſe to the Ohio, the Riviere Longue, the river St Lawrence, and the Miſſiſſippi, they are loſt in Canada. From the eaſtern ſhores of America to the weſtern ſhores of Europe, we find a vaſt interruption.

133 Alpine chain.

The European Alps produce three principal chains, which run towards the equator, and ſome ſmaller ones running towards the pole. The firſt ſouthern chain is ſent out through Dauphine; traverſes Vivarais, Lyonnois, Auvergne, Cevennes, and Languedoc; and, after joining the Pyrenees, enters Spain. There it divides into two or three ramifications, one of which runs through Navarre, Biſcay, Arragon, Caſtile, Marche, and Sierra Morena, and extends into Portugal. The other, after traverſing Andaluſia and the kingdom of Granada, and there forming a number of mountains, again makes its appearance, beyond the ſtraits of Gibraltar, in Africa, and coaſts along its northern ſhores, under the name of *Mount Atlas*.—The ſecond principal chain of the Alps paſſes out through Savoy and Piedmont; ſpreads its roughneſſes over the ſtates of Genoa and Parma; forms the belt of the Appennines; and after frequently changing its name, and dividing Italy into two parts, terminates in the kingdom of Naples and in Sicily, producing volcanoes in every part of its courſe. The third chain is ſent off from Hungary, and ſcatters innumerable mountains over all Turkey in Europe, as far as the Morea and the Archipelago at the bottom of the Mediterranean ſea. The northern branches, though ſmaller at firſt, are no leſs clearly defined; and ſome of them even extend their ramifications as far as the Frozen ocean. An Alpine branch, iſſuing from Savoy through the country of Gex, proceeds through Franche Comté, Suntgaw, Alſace, the Palatinate, and Veterabia.—

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Another iſſues from the territory of Saltzbourg, paſſes along Bohemia, enters Poland, ſends off a ramification into Pruſſia towards the deſerts of Waldow, and after having paſſed through Ruſſia is loſt in the government of Archangel.

134 Aſiatic Alps.

The Aſiatic Alps ſent forth in like manner ſeveral branches both to the ſouth and north. The Ouralic mountains, between the ſources of the Bielaia and the Jaik, produce three principal branches; the firſt of which, including the Caſpian ſea in one of its diviſions, enters Circaſſia through the government of Aſtracan, paſſes through Georgia under the name of *Caucaſus*, ſends a vaſt number of ramifications to the weſt into Aſiatic Turkey, and there produces the mountains, Tſchilder, Ararat, Taurus, Argée, and many others in the three Arabias; while the other diviſion, paſſing between the Caſpian ſea and the lake Aral, penetrates through Chorаſan into Perſia. The ſecond branch, taking a more eaſterly direction, leaves the country of the Eleuths; reaches Little Bucharia; and forms the ramparts of Gog and Magog, and the celebrated mountains, formerly known by the name of *Caf*, which M. Bailly has made the ſeat of the war between the Dives and the Peris*. It traverſes the kingdoms of Caſgar and Turkeſtan, enters through that of Lahor into the Mogul territory, and, after giving riſe to the elevated deſert of Chamo, forms the weſtern peninſula of India. While theſe two branches run towards the ſouth, the third branch of the Ouralic chain riſes towards the north, following almoſt the 79th degree of longitude, and forms a natural boundary between Europe and Aſia; without, however, bounding the immenſe empire of Ruſſia. This chain, after coming oppoſite to Nova Zembla, divides into two conſiderable branches. The one, running to the north-eaſt, paſſes along the Arctic ſhores; the other, proceeding towards the north-weſt, meets the northern European chain, traverſes Scandinavia in the ſhape of a horſe ſhoe, covers the low lands of Finland with rocks; and, as is obſerved by Dr Pallas, appears to be continued from the North Cape of Norway through the marine chain of Spitzbergen, ſcattering iſlands and ſhelves perhaps throughout the northern ocean, that, paſſing through the pole, it may join the northern and eaſtern points of Aſia and North America.

* *Lettres ſur les Atlantides*, let. 16.

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The Ouralic, which, in the country of the Mongols, becomes the Altaic chain, proceeds towards the equator. After forming the mountains and caverns wherein, as we are told, the aſhes of the Mongol emperors of the race of Gengis-Kan are depoſited, together with the vaſt plain of Chamo, conſiſting of arid ſand, and the frightful rocks and precipices of Thibet, which form the myſterious and deſert retreats of the Grand Lama, it croſſes the rivers Ava and Menan; contains in its ſubdiviſions the kingdoms of Ava, Pegu, Laos, Tonquin, Cochin-China, and Siam; ſupports the peninſula of Malacca; and overſpreads the Indian ocean with the iſles of Sunda, the Moluccas, and the Philippines. From the borders of the Baikal lake and of the province of Selinginſkoy, a branch is detached, which ſpreads over Chineſe Tartary and China, is continued into Corea, and gives riſe to the iſlands of Japan.

The great chain having extended to the north, near the city of Jakuck, upon the banks of the Lena, ſends off one of its branches to the north-weſt, which, paſſing between the two Tunguſta, is loſt in marſhy grounds lying in the northern parts of the province of Jenniſſeiſkoy. The ſame chain, after it has reached the eaſtern part of Aſia, is loſt in the icy regions of the north about Nos-Tſchalatſkoy, or the Icy Promontory, and Cape Czuczenſkoy.

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136 Southern elevations.

It will be more difficult, perhaps, to trace the elevated belt in the ſouthern hemiſphere beyond the tropic of Capricorn, than it has been to diſtinguiſh that towards the north. An immenſe extent of ocean ſeems to occupy the whole Antarctic part of the globe.—The greateſt ſouth latitude of the old continent is not more than 34 degrees, and South America ſcarcely extends to the 55th degree. In vain has the enterpriſing Cook attempted to diſcover regions towards the pole: his progreſs was conſtantly interrupted by tremendous mountains and fields of ice. Beyond the 50th degree no land and no habitations are to be found. The iſlands of New Zealand are the fartheſt land in theſe deſert ſeas; and yet the ſouth cape of Taral-Poenamoo extends only to the 48th degree: We do not mention Sandwich land, which is ſituated in the 58th degree, becauſe it is too ſmall and too low. It muſt be recollected, however, that, according to the declarations of travellers, the Cordilleras become higher as they advance ſouthward to the ſtraits of Magellan; and that Terra del Fuego, which lies in the latitude of 55, is nothing but a maſs of rocks of prodigious elevation. America, however, exhibits to our view elevated points, whence chains of mountains are diſtributed in different directions over the whole ſurface of the new continent. There muſt likewiſe be great reſervoirs, where the moſt remarkable rivers take their riſe, and from which they neceſſarily deſcend towards their mouths. In the ſouthern hemiſphere, this elevated belt is nearer the equator; and though it does not extend to the 50th degree, it is evidently to be met with, and may be accurately traced, between the 20th and 30th degrees. The high mountains of Tucuman and of Paraguay, which interſect South America about the 25th degree of latitude, may be conſidered as the American Alps. If we look into the map of the world, we ſhall be able to diſtinguiſh an elevated belt all along this parallel. In Africa, Monomotapa, and Caffraria, are covered with very high mountains, from which pretty large rivers deſcend. In the Pacific ocean, we find New Holland, New Caledonia, the New Hebrides, and the Friendly and the Society iſlands, under the ſame parallel. We may, therefore, with ſufficient propriety, diſtinguiſh this parallel by the name of the *Southern Alps*, as we have already diſtinguiſhed the elevated belt of the 50th degree of north latitude by that of the *Northern Alps*. In America, the Rio de la Plata, which, after a courſe of 500 leagues, falls into the ocean at the 35th degree of ſouth latitude; the Pavana, which riſes from the mountains of the Arapes, and falls into the Plata at Corriente; the great number of rivers which flow into that of the Amazons, ſuch as the Paraba, which receives in its courſe the tribute of more than 30 other rivers; the Madera, the Cuchirara, the Ucayal, &c. &c. all deſcend from theſe ſouthern Alps. From theſe Alps likewiſe three conſiderable branches of mountains are detached, which

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go by the common name of *Andes* or *Cordilleras*.—The firſt branch, which extends towards the ſouth, and paſſes out from Paraguay through Tucuman, ſeparates Chili from theſe provinces and from Chimito, and is continued through Terra Magellanica as far as Terra del Fuego. The ſecond branch, directing its courſe towards the equator, traverſes Peru, in vain endeavouring to conceal treaſures which the avarice of men has taught them to diſcover in its bowels; bounds the Spaniſh Miſſions; enters Terra Firma through Popayan; and unites South and North America by the iſthmus of Panama. The third diviſion, iſſuing from Paraguay through Guayra and the territory of Saint Vincent, traverſes Brazil, diſtributes ramifications into Portugueſe, French, and Dutch Guiana, croſſes the Oroonoko, forms the mountains of Venezuela, and near Carthagena meets the ſecond branch coming from Popayan.

137 Mountains of North America.

We have already ſuppoſed, that the elevated belt of North America was ſituated about the 45th degree of north latitude; and there we imagined we recognized the continuation of the northern Alps of the old continent. This chain likewiſe ſends forth conſiderable branches on both ſides. One of them is detached acroſs the ſources of the Miſſiſſippi, the Belle Riviere, and the Miſſouri, and at the entrance of New Mexico divides, in order to form California to the weſt, and the Apalachian mountains to the eaſt.—Thence proceeding through New Biſcay, the audience of Guadalaxara, Old Mexico, and Guatimala, it meets at Panama the ſouthern branch, which is part of the Alps of Paraguay. The ſecond branch, following the courſe of the Miſſiſſippi, ſeparates Louiſiana from Virginia; ſerves as a bulwark to the United States of America; forms the Apalachian mountains in Carolina; and at laſt, traverſing Eaſt Florida, encloſes the gulf of Mexico with the Great and Little Antilles. In the north, we can trace the branches of the elevated belt; on one ſide obſerve them proceeding towards Canada, directing their courſe through Labrador to Hudſon's Straits, and at length confounded with the rocks of Greenland, which are covered with eternal ſnow and ice. On the other ſide, we ſee them riſing through the country of the Aſſinipoels and the Kriſtinos, as far as Michinipis and the northern Archipelago.

138 Britiſh mountains.

In tracing the courſe and direction of the Britiſh mountains, we ſhall begin with the central chain, which runs through the ſouthern part of the iſland from north to ſouth, commencing at Geltſdale, about 14 miles to the ſouth-eaſt of Carliſle, and ending at Land's End in Cornwall, or rather in the Scilly iſles to the weſt of this. This chain paſſes from Geltſdale foreſt through the weſtern diſtricts of Durham and Yorkſhire, forming the hills called Kelton Fell. Stanmore, Widehill Fell, Wildbore Fell, Bow Fell, Home Fell, Bun Hill, &c. A little to the weſt of the chain ſtand ſeveral detached mountains, the principal of which is Skiddaw in Cumberland. Paſſing through Yorkſhire we find Craven, Whurnſide, Ingleborough, and Pennygent; and on the eaſt of Lancaſter is Pendle. In this courſe there are ſeveral miles of coal and lead. The chain next proceeds through Derbyſhire, and in this part of the ridge a great variety of valuable minerals are found, eſpecially lead, copper, gypſum, fluor, barytic earths, martial pyrites, iron ore, manganeſe, and ſeveral ores of zinc. About this point the ridge ſtretches a little into Cheſhire, and ſeems to terminate; a central chain of ſomewhat leſs elevation may, however, ſtill be traced, proceeding in a waving direction towards Saliſbury, and having three irregular branches, two to the eaſt, and another running to the ſouth-weſt into Cornwall. The firſt eaſtern branch proceeds towards Norfolk, and to this belong ſome conſiderable hills, eſpecially thoſe of Gog Magog in Cambridgeſhire. The ſecond branch paſſes into Kent, and diverges a little into Surry and Hampſhire. The continuation of this chain is afforded by the hills of Mendip, Polden, Ledgemoor, and Blackdown in Somerſetſhire; the Tores and Wilds of Dartmore in Devonſhire, and the upland Downs of Cornwall. Malvern hills in Worceſterſhire deviate a little from the chain, but thoſe of Cotſwold in Glouceſterſhire appear to be a continuation of it. The principal mineral found in this ridge of mountains, after leaving Derbyſhire, is the tin ore of Cornwall.

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Wales contains many mountains, eſpecially in its northern part, where Snowden is celebrated for its height and claſſical fame. The top of this mountain is formed almoſt into a point, and commands an extenſive view, not only of the neighbouring counties, but of part of Scotland and Ireland, and the iſles of Mann and Angleſey. A line of mountains proceeds from Snowden along the weſtern coaſt to Plinlimmon; and in this line lie Urrou Seth, Caeridris, and Moyle Vadiau. A few hills of little elevation proceed towards Shropſhire, among which the Wrekin is the moſt remarkable. Another ſmall chain proceeds ſouth towards Cardiff, but contains no hills of any eminence. 139

140 Scotch mountains.

Leaving England, and proceeding towards the north, we find the Cheviot Hills, ſo celebrated in the hiſtory of the border ſkirmiſhes. Theſe form a regular ridge, running from ſouth-weſt to north-eaſt, where they join the hills of Galloway. In this part of Scotland there are ſeveral mountainous ridges running in various directions, generally north and ſouth according to the courſe of the rivers; but there is, properly ſpeaking, no uniform chain. Dumfrieſsſhire contains ſeveral mountains, ſome of which are of a conſiderable height, eſpecially Hartfell in Annandale, from which proceeds the celebrated chalybeate ſpaw; Lowther near Leadhills; Blacklaw on the borders of Ayrſhire; Etrick Pen, in Eſkdale moor; Carnkinnow near Drumlanrigg; and Queensberry hill, which gives the title to the dukedom of that name. Proceeding towards the north, we find Pentland hills, a little to the ſouth-weſt of Edinburgh, and the romantic hills of Arthur's ſeat and Saliſbury Craigs, in the immediate vicinity of that city. On the eaſtern coaſt, before croſſing the Forth, is North Berwick Law, which muſt be conſidered as cloſing the liſt of ſouthern hills in Scotland. The principal part of theſe ſouthern hills conſiſts of calcareous earth, and argillaceous ſchiſtus; and except in thoſe of Galloway, granite and other primitive rocks are very ſparing. In the Lothian hills the calcareous ſtrata are ſurmounted by vaſt blocks of trap, wacke, and baſalt.

On the north of the Forth are the hills of Ochil, of little elevation, but celebrated for affording large quantities of agates and chalcedonies. The hills of Kinnoul and Dunſinnan in the eaſtern part of Perthſhire, are generally conſidered the laſt of the lowland hills.

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The principal northern chain of Britiſh mountains is that of the Grampian hills, extending from Loch Lomond to Stonehaven, and forming the ſouthern boundary of the Highlands; and riſing by a gradual tranſition from the Sidlaw hills on the eaſt, the Campſey hills on the weſt, and the Ochils in the middle. The principal mountains of this chain are Ben Lawers, Ben More, Schehallion, Ben Vorlich, Ben Lomond, and Ben Ledy. Near Ben Lawers is Ben Nevis, the higheſt mountain in Britain, and to the north-weſt of this, near Fort Auguſtus, is the long hill of Corri Allok. About 30 miles to the eaſt of this is the high mountain of Cairngorum, famous for the ſpecimens of quartzoſe ſtones found there. Numerous mountains lie in the ſecond diviſions of the Highlands, beyond Loch Linne, and Loch Neſs, eſpecially on the weſtern ſhore, which is crowded with hills. Few of theſe are conſiderable. To the weſt of Roſsſhire are ſeveral hills, among which Ben Chat, Ben Chaſker, and Ben Golich are the moſt remarkable. More inland ſtands the high mountain of Ben Wevis, nearly equal to Ben Nevis. In moſt of theſe mountains the primitive rocks prevail, and granite is often very abundant. Few minerals, however, except iron ore, are found.

141 Iriſh mountains.

Ireland contains but few mountains, and none of any conſiderable importance. They generally form ſhort lines, or appear in detached groups, one of the higheſt of which is that on the weſt and ſouth of the lake of Killarney, in which is the mountain of Mangerton. A ſmall line of hills called Sheeky mountains runs on the north-weſt of Bantry Bay, paſſing towards the eaſt. To the northward of this ſtands Sliblogher and Nagles, and towards the eaſt are the hills of Knockemdown. In the county of Leinſter is a mountain of the ſame name, and to the ſouth of Dublin are the Wicklow hills, from which there were lately ſuch great expectations of golden treaſure. In Ulſter ſtand the mountains of Mourne, the higheſt of which, Donard, is ſaid to be nearly the height of Mangerton. The moſt mountainous part of Ireland is the weſtern peninſula of that iſland, towards which, in the county of Mayo, ſtands Nephin, one of the higheſt in the kingdom. On the ſouth-eaſt of Clewbay is the mountain of Croagh Patrick, alſo in the county of Mayo, which is the laſt Iriſh hill of any importance.

We cannot here with propriety enter on the theory of the formation of mountains. The hypotheſis of the principal geological writers with reſpect to this ſubject, will be ſeen from the general view of the theories to be given in the next chapter. We may in this place only remark, that all the ſyſtems which have been conſtructed, to explain the formation of the primitive mountains, with reſpect to which there is the moſt diſpute, may be reduced to three.

In the firſt of theſe, mountains are ſuppoſed to have been formed ſuch as we now ſee them, except that they have ſuffered ſome degradations and modifications, from certain accidents poſterior to their original formation, and that theſe mountains owed their elevation above the places which ſurround them, to one ſingle accidental accumulation of more materials in one place than in another; an accumulation which might have taken place without that great precipitation which preceded and occaſioned the conſolidation of the cruſt of our globe.

In the ſecond hypotheſis, all the primitive mountains, are ſuppoſed to have been raiſed by one cauſe, and in one certain manner; and the materials which compoſe them, to have been thrown out of their natural poſition. It is with reſpect to this raiſing or diſplacement that geologiſts have imagined ſo many different hypotheſes.

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In the third general theory, theſe mountains are ſuppoſed to have become pre-eminent from the accidental lowering or removal of the materials which originally ſurrounded them, whether this happened from the materials compoſing theſe mountainous ſituations having ſuffered no diſplacement, or that they had been themſelves removed.

M. Dolomieu is of opinion, that there are mountains whoſe ſituation and ſtructure favour each of theſe three hypotheſes*.

* *Jour. de Min.* N° xlii. p. 421.

SECT. II. *Of Dykes.*

142 Hiſtory of dykes.

We have deſcribed dykes (N° 15.) to be thoſe interruptions of the ſtrata which are formed by perpendicular fiſſures filled with ſtony ſubſtances. As theſe ſtony matters are frequently of that kind called whinſtone, theſe dykes are commonly called *whin dykes*, and the hiſtory of theſe is very important, as they form one of the principal ſubjects in the principal theories of the earth.

143 Names.

Dykes have received different denominations, deſcriptive, in ſome meaſure, of the nature of the ſubſtances of which they are compoſed; or of the ſeeming effects they have produced on the interſected horizontal ſtrata. They are called *baſaltic veins*, *trap dykes*, *whin dykes*; and in the coal countries of Scotland they are called *gaws*, from the idea that they have occaſioned the ſeparation of the coal, and contiguous ſtrata, through which they run.

Theſe dykes have been more attentively obſerved in coal countries, than where they occur elſewhere; becauſe on the accurate knowledge of their courſe, inclination, and thickneſs, depend, in a great meaſure, the judicious and ſucceſsful operations of the miner, when his workings approach the dike, or render it neceſſary to cut through it to reach the ſtrata of coal on the other ſide. But, though leſs attended to, they have been obſerved and traced in other places, where a great extent of the horizontal ſtrata has been expoſed in the beds of rivers, as in the bed of the Water of Leith, above St Bernard's Well, near Edinburgh, and on the ſea ſhore, eſpecially on the weſtern coaſts of Scotland, where the rocks are more abrupt and precipitous, and where the violence of the Atlantic ocean has removed part of the horizontal ſtrata, and left the vertical ſtrata remaining, like immenſe walls or dykes. Hence probably the origin of the name; and as they often conſiſt of that ſpecies of ſtone called *whinſtone*, this epithet has been added.

144 Courſe.

The courſe, however, of the greater number which we have had the opportunity of examining, generally lies between the points of the compaſs S. and S. E. and N. and N. W. This is moſt frequently the courſe of the whin dykes of Iſlay and Jura; it is the courſe of a remarkable dyke which traverſes the coal ſtrata at the village of Stevenſon, near Saltcoats, in Ayrſhire; part of which is ſeen on the ſurface, not many hundred yards to the north of the weſt end of that village;

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lage; and it is the courſe of two dykes, ſtill more remarkable, in the iſland of Great Cumbray, in the frith of Clyde.

Geologiſts, who have treated this ſubject, do not ſeem to have marked, with much attention, the courſe of the dykes. They have mentioned in general terms, that they follow all directions. More extenſive obſervation may probably ſhew, that the moſt frequent directions of the principal dykes, is from north to ſouth, or a few points deviation from that courſe. And if this be eſtabliſhed, by a fuller and more accurate hiſtory of dykes, the analogy between them and metallic veins will be more complete; for it is obſerved of the latter, that the moſt powerful, that is, the moſt productive, run from north to ſouth.

Dykes do not always run in a ſtraight line. In their courſe they form certain ſexuoſities. But, in this winding courſe, the deviations are uſually ſo ſmall, as to have little effect on the general direction of the dyke, which, upon the whole, may be conſidered as nearly the ſame.

The continuity of dykes is ſometimes interrupted, exactly in the ſame manner as frequently happens to the horizontal ſtrata, and which, in technical language, is termed a *ſlip*.

In the iſland of Iſlay we have obſerved two dykes of this deſcription, the one on the ſouth ſide of Lochindal, near the point of Laggan; the other on the ſhore of the ſouth-eaſt part of the iſland, a little to the ſouth of the houſe of Ardmore. In both theſe dykes, the extent of the ſeparation of the ſlip was juſt equal to the thickneſs of the dyke. The oppoſite ſides were brought exactly into the ſame line.

After this ſeparation, theſe dykes, in ſo far as they could be traced, preſerve the ſame thickneſs, courſe, and inclination as formerly.

A very remarkable dyke has been diſcovered, in the coal field, in the diſtrict of Boulogne in France. It runs in the form of a creſcent from north to weſt.

145 Inclination. The direction of dykes downwards is ſeldom perpendicular. This deviation from a line perpendicular to the horizon is called their inclination. The inclination of a dyke is uſually denominated the *hade* or *hading*. See the article COALERY.

The inclination of different dykes, and even of the ſame dyke, is various, ſometimes approaching to, and ſometimes deviating from the perpendicular. The extent of dykes downwards, we believe, has not been aſcertained with any degree of accuracy, and the termination of very few has yet been detected. The depth to which reſearches of this kind can be carried, is comparatively ſmall. With all the ardour, ingenuity, and power of man, inveſtigations to determine this point, will probably always be limited by the extent of his mining operations. The creſcent-formed dyke juſt mentioned, which occurs in a coal-field in the diſtrict of Boulogne in France, which conſiſts of a ſpecies of marble, found in ſeveral quarries in the vicinity, has been traced to the perpendicular depth of 600 feet, where it is ſucceeded by a ſchiſtus rock, which latter, with the ſame courſe and inclination, continues to interſect the horizontal ſtrata.

146 Extent. The extent of dykes in length has not been accurately determined. Indeed, it muſt be extremely difficult to trace them with any degree of certainty. For thoſe which are obſerved on the ſea coaſt, where they are moſt conſpicuous, ſoon diſappear in the mountains, on the one hand, or on the other loſe themſelves in the ſea. And, as the extent of the ſame coal field rarely exceeds a few miles, they have ſeldom been followed beyond its limits. In many caſes, the change in the nature and arrangement of the ſtrata, renders it almoſt impoſſible. Some, however, have been traced to a very great extent; one in particular, on the banks of the river Meuſe in the Netherlands, has been followed in its direct courſe, to the diſtance of four leagues; and of this dyke it is obſerved, if purſued through all its windings, the extent is not leſs than ſix leagues.

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147 Thickneſs. The thickneſs of dykes is various. Sometimes they are obſerved no thicker than a few inches. From that they increaſe to one foot, ſix feet, and very often are found from 10 to 20 feet. There is one in the iſland of Iſlay, of the enormous thickneſs of 69 feet. This immenſe dyke accompanies a lead vein, about a foot thick, which is included between it and the limeſtone ſtrata. In this mining field, two whin dykes, one of them 10 feet thick, have been diſcovered, croſſing the metallic veins.

In going downwards, dykes are ſaid to decreaſe in thickneſs. This is particularly obſerved of dykes of ſmaller magnitude. Of ſmaller dykes it is alſo ſaid, that they diminiſh in thickneſs towards the extremities.

In one reſpect, ſome whin dykes are exactly analogous to metallic veins, in having branches, or in the miners phraſe, *ſtrings* going off and traverſing the contiguous ſtrata, and forming in the courſe they take, an acute angle with the principal dyke. A whin dyke of this deſcription has been obſerved in the iſland of Jura, on the ſhore of the ſound. The diverging branch terminated in a point among the horizontal ſtrata, at the diſtance of a few feet from the great dyke, aſſuming altogether a wedge-like form.

148 Materials. If we include metallic veins in the account, the vertical ſtrata may be ſaid to be compoſed of every kind of mineral ſubſtance, but almoſt always different from the interſected horizontal ſtrata. By this laſt circumſtance their occurrence is at once recognized. In general, the dykes that are found in Scotland, whether in the coal countries, or in the weſtern coaſts and iſlands, where they are ſo frequent, are of that ſpecies of ſtone which comes under the denomination of trap or whinſtone. Dykes, conſiſting of other ſpecies of ſtone, have alſo been found in Scotland. On the Mull of Kinouth, which forms the ſouthern headland, at the entrance of Lochindal, in Iſlay, we obſerved a ſmall dyke of granite, croſſing the headland, which is of granular quartz. There are ſome vertical ſtrata of granite in the iſland of Icolmkill, of pitchſtone in the iſland of Arran, and of ſerpentine at Portſoy in Banffſhire.

Bergman, in his Phyſical Geography, ſuppoſes that granite was never found to be a component part of vertical ſtrata. What has been already mentioned proves the contrary. Granite dykes have alſo been diſcovered in other places. Beſſon has obſerved dykes of this deſcription on the great road between Limoges and Cahors in France, traverſing horizontal ſtrata of argillaceous ſchiſtus, a ſpecies of ſtone which has generally been conſidered of later formation than granite. Theſe dykes, he obſerves, are from an inch to

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fix feet in thickneſs, and the quartz, feldſpar, and mica, are of larger ſize than are uſually found in the granite of mountains. Dolomieu has made a ſimilar obſervation, and conſiders it as a diſcriminative character, by which the granite of mountains and that found in vertical ſtrata may be eaſily diſtinguiſhed. But this is not always to be admitted as a characteriſtic mark of diſtinction. The granite dyke which has been already mentioned, croſſing the granular quartz, on the Mull of Kinouth in Iſlay, is ſmall grained, and others of this latter deſcription have been obſerved in other places.

There is a very ſingular dyke on the coaſt of Ayrſhire, between Weems bay and Largs, near the houſe of Kelly. It is about ten feet thick, traverſes the horizontal ſtrata, which conſiſt of plumb-pudding rock, whoſe cement is ſandſtone of a red colour, from north-eaſt to ſouth-weſt, and croſſes a larger dyke of the whinſtone of this country, nearly at right angles. This dyke is compoſed of different materials. Part is of the common whinſtone, and part of a plumb-pudding rock, cemented by the matter of the dyke; and theſe alternate with each other, both in the thickneſs of the dyke, and lengthwiſe. On one ſide, there are four feet thick of whinſtone; immediately in contact with this there is plumb-pudding ſtone three feet thick, and ſo on alternately, acroſs the whole dyke. In tracing the dyke lengthwiſe acroſs the whole line, there is found a few yards of whinſtone, which is ſucceeded by a few yards of plumb-pudding ſtone, and this is again ſucceeded by the whinſtone.

But, for the general view which is here propoſed, it is not requiſite to give a full account of all the mineral ſubſtances which enter into the compoſition of vertical ſtrata, or even a minute enumeration of all the varieties that are found in whin dykes.

149 Peculiar ſtructure of whin dykes.

One of the moſt ſingular circumſtances reſpecting whin dykes, which ſeems to have been entirely overlooked by geologiſts, ſtill remains to be conſidered. This is the peculiar ſtructure or arrangement of the parts of which they are compoſed. Of this peculiar arrangement it may be obſerved in general, that it is in all reſpects the reverſe of what takes place in the horizontal ſtrata.

When the dyke is of ſmall magnitude, it is pretty compact in all its parts; but if an attempt be made to break or ſeparate any part of it, the fracture will be found to run moſt readily in the perpendicular direction. But when the dyke is of more conſiderable thickneſs, it uſually forms ſeveral diviſions, marked by perpendicular fiſſures, and there is often very great variety in the nature and qualities of the ſeveral diviſions of the ſame dyke. The exterior diviſion of one ſide ſometimes, and ſometimes the exterior diviſion of both ſides, are of a ſofter texture than the intermediate diviſion; and often contain, in great proportion, ſpecks of radiated zeolite and calcareous ſpar, while the middle diviſions, as well as being harder, are alſo more homogeneous. In other caſes, the reverſe of this appears. The middle parts of the dyke are the ſofteſt and leaſt compact, exhibiting the greateſt variety of heterogeneous ſubſtances.

Some whin dykes have a great tendency to aſſume, when broken, the priſmatic form. This is the caſe with many, even of the moſt compact texture. In others, where the ſide of the dyke is expoſed to view, and minutely examined, fiſſures may be traced, diſcovering the ends of pretty regular priſms. But in ſome dykes in the iſland of Jura, the priſmatic columns are entirely ſeparated, and lying looſe, are four, five, or ſix-ſided, jointed; the perpendicular fiſſures forming the joints, and in all reſpects ſimilar to the perpendicular baſaltic columns, except being in the horizontal poſition. In one of the dykes in the iſland of Jura, the columns are from 12 to 18 inches in diameter. In ſome others on the ſea ſhore, near the houſe of Mr Campbell of Jura, and at the harbour of the ſmall iſles, in the ſame iſland, there are columns of the enormous ſize of 10 and 12 feet diameter.

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A dyke which traverſes the baſaltic ſtrata of the Giants Cauſeway in the north of Ireland, exhibits ſtill more remarkably this peculiarity of ſtructure. The ſmalleſt maſſes detached from it aſſume the columnar form, and moſt of them are perfectly regular. The fracture invariably runs in the horizontal direction; the columns conſequently lie in the ſame poſition, are three, four, five, and ſix-ſided, and are generally of ſmall ſize. *Obſervations on Vertical Strata, by* Dr Millar, *Scots Mag.* vol. lxiv.

Sect. III. *Of Metallic Veins.*

150 Metallic veins.

The hiſtory of metallic veins, although far from being ſo full and ſatisfactory as could be wiſhed, is more complete than that of whin dykes. The latter have excited no farther attention than as objects of curioſity to the geologiſt, or as ſingular facts in eſtabliſhing a theory, and when they come in the way of the operations of the miner, to diſcover their connexion with the contiguous ſtrata; while the wants and luxuries of man have rouſed ingenuity and exertion in exploring the former, on account of the precious and uſeful metals with which they are ſtored. Thus, the ſplendour and beauty of ſome metallic ſubſtances, and the utility of others, have made them in all ages be eſteemed and valued by mankind; and conſequently they have been the conſtant objects of purſuit and inveſtigation. It is obvious that the beauty and utility of metals, on account of which they are ſo much valued and ſought after, excite greater intereſt in procuring them; on the one hand, the reſearches and obſervations of the philoſopher in furniſhing the hiſtory and general principles, and, on the other, the immediate application of this knowledge, and of theſe principles, in the practice and operations of the miner.

The hiſtory of whin dykes is, in general, quite analogous to metallic veins; but, of the latter, from what has been ſtated, we can ſpeak with more certainty and preciſion.

151 Diſtinction of veins.

Three different kinds of metallic veins have been deſcribed by geological writers; the *perpendicular* vein, the *pipe* vein, and the *flat* or *dilated* vein. We ſhall conſider each of theſe in their order.

152 Perpendicular veins.

1. *Of the perpendicular vein.*—This kind of metallic vein occurs moſt frequently. As may be expected, it is various in its courſe or direction, thickneſs, and inclination. Metallic veins are found running in every direction; but, in general, the moſt powerful veins, that is, the moſt productive, are obſerved to run from north to ſouth, or at leaſt a few points deviation from that courſe; and when any deviation happens, it is uſually to the eaſt of north, and to the weſt of ſouth.

153 Courſe of veins.

The courſe or direction of a vein is called in techni-cal

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cal language its *bearing*. The extent of a vein in the line of bearing, we believe rarely exceeds the range of mountains in which it is discovered. This is the case with the principal vein at Leadhills. It is limited to the chain of mountains in which the operations are now carried on; and although the mines of Wanlockhead are not a mile distant, new veins appear with galena or lead ore, of quite a different quality, and all the accompanying minerals, whether forming part of the vein, or found in cavities, are also quite different from the lead ore and other minerals found in the veins at Leadhills.

154 Inclination.

The inclination of veins is various. Sometimes they are nearly perpendicular; sometimes they deviate considerably from a perpendicular line; sometimes the same vein in its course downward, inclines to one side; sometimes it is perpendicular, and sometimes it inclines to the other side. When the deviation from the perpendicular does not exceed 10°, the vein is still considered as a perpendicular or vertical vein. When a vein is inclined, the two sides which include the metallic substances are in very different positions, and have consequently received from the miners different names. That side which supports the metallic ore, or on which it seems to lean, is called the *ledger side*, or simply the *ledger*. The opposite side which covers the ore, or which overhangs it, is denominated the *hanging side*, or simply the *hanger*. From the inclination of the vein being varied in its course downwards, it must appear that the same sides, according as the inclination varies, must change their position and denomination. This will perhaps be more intelligible by the section at fig. 5. in which AA represents the vein; BB, CC, DD, EE, the strata intersected by it; 1. the hanger; 2. the ledger; 3. the hanger; and, 4. the ledger.

155 Thickness.

The thickness of veins, and indeed of the same vein, is also extremely various. Sometimes they are only a few inches thick. From this they increase to the thickness of several feet. The veins which were wrought at Leadhills, about seven years ago, were from two to six feet within the sides; but some years before that time the principal vein in those mines, by the addition of two strings or small veins, assumed the extraordinary thickness of 14 feet of pure ore. This unusual appearance, both on account of its richness and grandeur, excited so much attention and admiration, that the countess of Hopetoun undertook a journey to these inferior regions, not less than 150 fathoms below the surface of the earth, to witness the splendour and brilliancy of this subterraneous apartment. The uncommon thickness and abundant riches of this vein are still talked of at Leadhills with enthusiasm. But a thicker vein was once wrought at Llangunog in Wales. Fifteen feet of clean ore were for some time dug out of this vein. These are, however, far exceeded by the copper veins in the Parys mountain in Anglesea, which are described by Mr Pennant in his Welsh tour. The thickness of one of these veins is 21 feet, and of another 66 feet.

The broadest metallic vein, of which we have any account, is, we believe, that of the Ecton copper mine, in Derbyshire. In this mine there was worked, at one time, a heap of ore, of the astonishing extent of 70 yards from side to side *.

* *Mawe's Derbyshire*, p. 112.

The extent of veins downwards has in many cases been ascertained. To the regret and disappointment of the miner, they have been frequently intercepted and entirely cut off by the horizontal strata. The rich vein of lead ore at Llangunog in Wales, which we have already mentioned, was intercepted in this manner by a stratum of black schistus or shiver, the nature of which is not described by Williams, who states the fact *. Their researches to recover their lost wealth, which were prosecuted for several years, proved altogether fruitless. The smallest trace of this unusually productive vein was never afterwards discovered.

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* *Mineral Kingdom*, vol. i. p. 274.

156 Two kinds of perpendicular veins.

Two kinds of perpendicular mineral veins have been observed and described. In the one case the relative position of the strata which contain the metallic substances is exactly similar to that of the coal strata when they are intersected by a whin dyke. On one side of the vein the strata are elevated or depressed from their former plane. This is illustrated by fig. 5. where the letters BB, CC, DD, EE, mark the corresponding strata which have been deranged or displaced. In the other kind of vein the mineral substances containing the metallic ores are merely separated without any elevation or depression; for each side of the fissure still remaining in its former plane, the opposite sides of the divided strata exactly correspond to each other. The mines at Strontian in Argyleshire are of this latter description.

Veins of this kind have frequently smaller veins, or, as they are called in the language of the miners, *strings*, which run off at an acute angle, preserve their course for some distance, not, in general, very great, gradually diminish in thickness, and at last are entirely lost among the contiguous strata. At the place of junction the principal vein is always thicker, as has been already noticed with regard to the unusual thickness of the principal vein at Leadhills.

To this account of perpendicular veins we may add, that some veins are found crossing each other, and that whin dykes have also been discovered intersecting metallic veins. Examples of the latter occur in the island of Islay.

157 Pipe vein.

2. *Of the pipe vein.*—The perpendicular vein last described, intersected or cut the strata across. What has been denominated the pipe vein is extremely limited in the line of bearing, but having the same inclination as the strata which include it. It may be considered as in some measure of a circular form, extremely irregular, and always following the course of the strata between which it is included, like the perpendicular veins; sometimes as it dips downwards, it is enlarged; sometimes it is diminished, and sometimes it is so much contracted, that the including strata come into close contact. In a word, this kind of vein is subject to all the irregularities of the veins formerly described, only that its inclination is invariably the same with the accompanying strata.

158 Flat vein.

3. *The flat or dilated vein.*—This kind of metallic vein, after what has been said with regard to other veins, will require but a short description. It is exactly similar to the pipe vein, only that it is more extended in the line of bearing. It is included between the horizontal strata; and therefore its inclination or dip must be the same as the including strata. A vein of this kind might with more propriety and accuracy be regarded as a metallic horizontal stratum, were it not

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that it is always found varying in its dimenſions, and equally irregular as the perpendicular veins which interſect the horizontal ſtrata.

It is almoſt needleſs to add, that the flat or horizontal veins are ſubject to the ſame derangement as the coal ſtrata, when they are interſected by a whin dyke. The vein, along with the including ſtrata, is either elevated or depreſſed, and the ſame thing takes place when they are traverſed by a metallic vein. MS. by Dr Millar.

159 Metallic ores.

To finiſh the ſketch of the hiſtory of metallic veins, we have only to enumerate the different metallic ores that occur in them, and to mention the places where theſe are found in greateſt abundance. In this enumeration we ſhall follow the arrangement of metals given by Brochant, in the ſecond volume of his *Traité Elémentaire de Mineralogie*.

In naming the ſeveral ſpecies, we ſhall adopt the nomenclature of Kirwan, adding the French and German ſynonyms to each. As it would far exceed our limits to give even a *curſory deſcription* of the ſeveral ſpecies, we refer the reader for that to the article MINERALOGY in this work, or to the elementary treatiſes of Kirwan or Brochant, or the more extenſive treatiſe of Haüy.

I. PLATINA

160 Platina ores.

Has been found hitherto only in its metallic or native ſtate, and it has as yet only been met with in South America, eſpecially at Choco in New Grenada. It is found in the ſand of rivulets, and probably comes from the primitive mountains.

II. GOLD.

161 Gold ores.

Native gold.—This is found principally in primitive mountains, ſometimes in veins, and ſometimes diſſeminated through the ſtony matter. The ſubſtances which moſt commonly accompany it are quartz, feldſpar, calcareous ſpar, heavy ſpar, pyrites, red ſilver ore and vitreous ſilver ore, and galena. Gold is ſtill more commonly met with in the ſand waſhed from certain rivers. The countries where gold is chiefly found in rocky ſubſtances, are Hungary, Tranſylvania, Peru, Mexico, Siberia, and Sweden. It has alſo been found in France, near the town of Oiſans, in the department of the Iſere; but not in ſufficient abundance to render the working of the mine profitable. Among the rivers whoſe ſands furniſh gold, we may enumerate the Rhine, the Danube, and the Aranioſch in Tranſylvania.

Gold has been found in ſeveral parts of the Britiſh dominions, eſpecially at Silſoe in Bedfordſhire, in the Wicklow hills in Ireland, and in the neighbourhood of Leadhills in Lanarkſhire. It is ſaid that a jeweller, who died lately in Dublin, often declared that gold, to the value of 30,000l. had paſſed through his hands, which was brought from the Wicklow hills. This mine is now in the hands of government, but we believe does not anſwer the expectation that was firſt formed as to its produce. General Dirom informs us, that in the reign of James V. of Scotland, 300 men were employed for ſeveral ſummers in waſhing the ſand near Leadhills, for gold of which they are ſaid to have collected to the amount of 100,000l. ſterling. It is ſaid that pieces of gold, an ounce in weight, have been found at Leadhills, and that Lord Hopetoun has a piece ſtill larger in his poſſeſſion *.

* *Mawe's Derbyſhire*, p. 159.

III. MERCURY.

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162 Mercury ores.

Species 1. *Native Mercury*, or *Quickſilver*. Le Mercure natif. Gediegen Queckſilber.—This is found at Idria in the Auſtrian territories; at Almaden in Spain; in the Palatinate, and a few other places. We are told by Mr Jameſon, that a quantity of quickſilver was diſcovered ſome years ago in a peat moſs, in the iſland of Iſlay, and he thinks it probable that veins of it exiſt there *; but there ſeems no ground whatever for ſuch expectations.

* *Min. of the Iſles*, vol. i. p. 153.

Species 2. *Natural Amalgama*. L'Amalgame natif. Naturalicher Amalgam.—This conſiſts of mercury and ſilver, in very variable proportions. It is found at Sahlberg in Sweden; at Roſeneau in Hungary, and eſpecially at Moſchellandſberg in the duchy of Deux Ponts, where it is found mixed with common ferruginous clay, and with other ores of mercury.

Species 3. *Mercury Mineraliſed by the Sulphuric and Muriatic Acids*. Mercure Cornée *ou* Muriaté. Queckſilber Hornerz.—This ſpecies was diſcovered about 30 years ago, in the mines of Moſchellandſberg, and at Morefeld, in the duchy of Deux Ponts, by M. Woulfe, mixed with ferruginous clay, quartz, lithomarga, native quickſilver, and cinnabar. It has alſo been found at Almaden in Spain, and at Herſowitz in Bohemia; but it is very rare.

Species 4. *Native Cinnabar*. Le Cinnabre. Zinnober.—This uſually forms a gangart for the other ores of mercury. It occurs in the ſtratiformed mountains, pretty near the ſurface. This ore is found in a great many parts of Europe, eſpecially at Almaden in Spain, Idria in the Auſtrian territories, at Moſchellandſberg, in Bohemia, in Saxony, in Hungary, in Tranſylvania, in the Palatinate, and in France; but in this laſt it is found but in ſmall quantity.

IV. SILVER.

163 Silver ores.

Species 1. *Native Silver*.—A particular variety of this ſpecies, mixed with gold, is very rare. It is principally found in Conigſberg in Norway, and Schlangenberg in Siberia. In the former of theſe places it is found diſſeminated through calcareous ſpar, fluor ſpar, and rock cryſtal, in a vein running through a rock of hornblende ſlate, and accompanied with blende, galena, and pyrites. That of Siberia is found diſtributed through a maſs of heavy ſpar.

Common native ſilver is found in conſiderable quantity in Mexico and Peru. It is alſo met with in Siberia, Saxony, France, Sweden, Norway, in the Hartz, and in Bohemia. It is principally found in the primitive mountains, diſtributed through maſſes of heavy ſpar, quartz, calcareous ſpar, fluor ſpar, pyrites, blende, cobalt, galena, red ſilver ore, and vitreous ſilver ore.

Silver has been found in ſeveral parts of Britain, eſpecially near Alva in Scotland. It is confidently affirmed, that a maſs of capillary ſilver, weighing 16 oz. was found in the lead mines at Garthoneſs in the iſle of Iſlay, mixed with galena †.

† *Min. of Iſles*, vol. i. p. 152.

Species 2. *Antimoniated Native Silver*. L'Argent Antimonial. Spieſglas Silber.—This ſpecies has hitherto been only found in the mine at St Wenceſlas at Altwolfach, and in the duchy of Wirtemberg, in a vein mixed with calcareous ſpar, heavy ſpar, native ſilver, and quartz.

Species

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Species 3. *Arſeniated Native Silver.* L'Argent Arſenical. Arſenik Silber.—This is alſo rare, having been found only at Andreaſberg, in the Hartz, and at Kaſſala in Spain. In the Hartz it is mixed with native arſenic, red ſilver ore, galena, blende, and calcareous ſpar. Conſiderable quantities of ſilver, probably of this ſpecies of ore, are obtained from the lead ore of Leadhills.

Species 4. *Corneous Silver Ore*, or *Muriated Silver.* L'Argent Cornée *ou* Muriaté. Horn Erz.—This has been found in Peru, Mexico, Saxony, France, Siberia, and, as is affirmed, in Cornwall in England.

Species 5. *Sooty Silver Ore.* L'Argent Noir. Silberſchwarze.—This is found in Saxony, France, and Hungary, mixed with other ores of ſilver, and ſometimes with native ſilver.

Species 6. *Vitreous Silver Ore.* L'Argent Vitreux. Silberglaſerz.—This is found in Bohemia, Saxony, Norway, Swabia, Siberia, and in Hungary, mixed with other ſilver ores, and uſually accompanying calcareous ſpar, heavy ſpar, and fluor ſpar.

Species 7. *Red Silver Ore.* L'Argent Rouge. Rothgiltegerz.—This is found in the Hartz, Bohemia, Saxony, France, Swabia, and in Hungary, accompanying native arſenic, realgar, vitreous ſilver ore, galena, calcareous ſpar, and heavy ſpar.

V. Copper.

164 Copper ores.

Species 1. *Native Copper.*—This is met with in Siberia, the Uralian and Altaiſchan mountains, Kamtſchatka, Japan, Saxony, France, Sweden, Hungary, Palatinate, and near Redruth in Cornwall, in England. It uſually accompanies other ores of copper, eſpecially malachite and copper azure.

Species 2. *Vitreous Copper Ore.* Le Cuivre Vitreux. Kupferglas.—This is found in Siberia, Hungary, Sweden, Norway, Ruſſia, Saxony, Sileſia, Heſſe, and in Cornwall.

Species 3. *Purple Copper Ore.* La Mine de Cuivre Violette. Buntkupfererz.—This is always found in the neighbourhood of other copper ores, eſpecially with the ſpecies laſt mentioned, and with copper pyrites. It is found in Saxony, Bohemia, the Bannat in Tranſylvania, the Hartz, Norway, Ruſſia, Sweden, Hungary, Heſſe, and in Derbyſhire in England, eſpecially in the famous Ecton copper mine.

Species 4. *Yellow Pyrites*, or *Yellow Copper Ore.* La Pyrite Cuivreuſe. Kupferkies.—This is the moſt common ſpecies of copper ore, and is found both in primitive and ſecondary mountains, ſometimes in beds, and ſometimes in veins. It occurs moſt abundantly in Bohemia, Saxony, Hungary, Sweden, France, Spain, and eſpecially in Britain, where it forms one of the principal varieties of copper ores, found in the famous Parys mine in the iſle of Angleſea.

Species 5. *White Copper Ore.* La Mine de Cuivre Blanche. Weiſskupfererz.—This ſpecies is very rare, but it has been found in Saxony in the mines of Freyberg, in Heſſe, in Wirtemberg, and in Siberia, with other copper ores.

Species 6. *Gray Copper Ore.* Le Cuivre Gris. Fahlerz.—This again is a very common ſpecies, and is found in all thoſe countries that poſſeſs mines of copper.

Species 7. *Black Copper Ore.* Le Cuivre Noir. Kupferſchwarze.—This is found mixed with malachite and with green and blue copper ores in Saxony, Hungary, in the Bannat, in Sileſia, in Norway, in Ruſſia, in Swabia, in Sweden, and in Siberia. It alſo occurs in the Parys mine of Angleſea.

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Species 8. *Florid Red Copper Ore.* Mine de Cuivre Rouge. Roth-kupfererz.—This uſually accompanies native copper, malachite, and brown earthy iron ore. It is met with in Saxony, in the Bannat, in the Hartz, in Norway, in Siberia, near Cologne, and in Cornwall.

Species 9. *Brick-red Copper Ore.* Le Mine de Cuivre couleur de Brique. Ziegelerz.—Found in ſimilar ſituations with the preceding.

Species 10. *Blue Calciform Copper Ore.* L'Azur de Cuivre. Kupferlazur.—Found in the Bannat, in Heſſe, in Saltzburg, in Poland, in Siberia, in Thuringia, and in the Tyroleſe. It is uſually imbedded in ſlaty marl, or in ſandſtone, not far below the ſurface of the earth.

Species 11. *Malachite.*—This is always found mixed with other copper ores, and occurs in moſt of the copper mines that have been enumerated,

Species 12. *Mountain Green.* Le Vert de Cuivre. Kupfergrün.—This commonly accompanies ſpecies 4, 6, 9, 10, and 11. It is found in Saxony, in the Hartz, in Norway, Sileſia, Siberia, Hungary, Wirtemberg, and Britain, as at Leadhills and in Derbyſhire.

Species 13. *Olive Copper Ore.* Mine de couleur Olive. Olivenerz.—This ſpecies is extremely rare. It has been found chiefly near Karrarach in Cornwall, where it is accompanied by ſpecies 11 and 12, and brown iron ore in a gangart of yellow lithomarga mixed with quartz. It is ſaid to have been found alſo at Jonſbach near Ruſtelſtadt in Sileſia.

VI. Iron.

165 Iron ores.

Species 1. *Native Iron.*—This ſpecies is very uncommon; but it has been met with in ſeveral places, eſpecially at Kamſdorf and Eibenſtock in Saxony, at Kranſnajarſk near Jeniſei in Siberia, at Olumba near St Jago in South America, and Oulle near Grenoble in France. The two moſt remarkable ſpecimens of native iron are thoſe found in South America and in Siberia. The former of theſe forms a maſs weighing at leaſt 300 quintals, or 15 tons. It is ſoft and malleable, and in every reſpect like the pureſt iron. That of Siberia is a ſpheroidal maſs, weighing about 14 quintals, reſting on the ſurface of the earth, near the ſummit of a mountain. Its texture is cellular, and its cavities are filled with a tranſparent, greeniſh, vitreous matter. No mines or veins of iron are in the neighbourhood of either.

Species 2. *Martial Pyrites.* Pyrite Martiale. Schwefelkies.—This ſpecies is one of the moſt common ores of iron, and is found abundantly in every country where there are any other ores of iron. There are three varieties of it deſcribed by Brochant, which are leſs common, but theſe are alſo found in many places.

Species 3. *Magnetic Pyrites.* La Pyrite Magnetique. Magnetkies.—This has been found only in primitive rocks, eſpecially in micaceous ſchiſtus, accompanied by quartz, hornblende, &c. and uſually lying in beds mixed with other pyrites, galena, and magnetic iron-

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ſtone. It is found in Saxony, Bavaria, Norway, and Sileſia.

Species 4. *Magnetic Ironſtone.* Le Fer Magnetique. Magnetiſcher Eiſenſtein.—Of this there are three varieties, the common magnetic ore, which is very common in primitive mountains, eſpecially thoſe that are compoſed of gneiſs and micaceous ſchiſtus. It is often in great abundance, forming large beds, or even whole mountains. It is found in greateſt quantity in Saxony, Bohemia, Italy, Corſica, Sileſia, Siberia, Norway, and eſpecially in Sweden. The ſecond variety, called fibrous magnetic ironſtone, is uncommon, but is found at Bibſburg in Sweden. The third, which Kirwan calls *magnetic ſand*, is found in the banks of ſome rivers, particularly of the Elbe, as alſo in Sweden and Italy.

Species 5. *Specular Iron-ore.* Le Fer Speculaire. Eiſenglanz.—This is found in many places, often in conſiderable quantity, eſpecially in Saxony, Bohemia, France, Normandy, Pruſſia, Sweden, Siberia, Hungary, Corſica, and the iſland of Elba. It is generally found only in primitive mountains, ſometimes in beds, ſometimes in veins, accompanied with quartz, hornſtone, martial pyrites, and magnetic iron ore.

Species 6. *Red ſcaly Iron Ore.* La Mine de Fer Rouge. Roth-Eiſenſtein.—This is rather rare, but is found in ſeveral parts of Saxony, in the Hartz, in Naſſau, in Thuringia and Hungary. Another variety of the ſame ſpecies, the compact red ironſtone of Kirwan, is much more common, being found in Saxony, Bohemia, the Hartz, Heſſe, Siberia, and in France, ſometimes in veins, and ſometimes in beds, commonly mixed with the two following ſpecies, and with argillaceous ironſtone, quartz, hornſtone, and calcareous ſpar.

A third variety, the common hematites or bloodſtone, which is one of the moſt productive iron ores, is always found accompanying the laſt variety, and is of courſe met with in moſt of the ſituations above enumerated. It is procured in abundance in ſeveral parts of England, as in Derbyſhire, but more eſpecially at Ulverſton in Lancaſhire, where there is one perpendicular vein of it 30 yards wide, in a rock of limeſtone. Large quantities of it are carried to Carron, where it is ſmelted with the common Carron ironſtone.

Species 7. *Brown Iron ore.* La Mine de Fer Brune. Braun-eiſtenſtein. —Of this there are ſeveral varieties, of which the compact brown ironſtone, and the brown hæmatites, are very common; but the brown ſcaly iron ore is rather rare. The laſt is found at Kampſdorf in Saxony, at Klauſthel, in the Hartz, at Lauterick in the Palatinate, and at Naïla in the principality of Bareith.

Species 8. *Calcareous Iron Ore.* Le Fer Spathique. Spathiger-eiſtenſtein.—This is found both in primary and ſecondary mountains, and there are few veins of iron which do not contain it in greater or leſs quantity.

Species 9. *Black Ironſtone.* La Mine de Fer Noire. Schwarz-eiſtenſtein.—This is found in the principality of Bareith, in the Hartz, Saxony, Heſſe, and Palatinate.

The common argillaceous iron ore of Kirwan, is ranked by Brochant as a variety of this. It is very common in moſt iron countries, and much of it is found in Britain, eſpecially in Colebrook-dale, Shropſhire, and in Dean foreſt in Glouceſterſhire. The Carron ore is principally of this kind.

Species 10. *Lowland Iron Ore.* La Mine de Fer de Gazon. Reaſen-eiſtenſtein.—There are ſeveral varieties of this, all of which are found in low, humid ſituations, in very extenſive beds, alternating with ſandſtone, clay, &c. This ſpecies is much more abundant in the north than in the ſouth of Europe, eſpecially in the duchy of Brandenburg, in Courland, Lithuania, Livonia, Pruſſia, Pruſſian Poland, and Luſace. General Distribution of the Materials of the Earth.

Species 11. *Blue Martial Earth.* Le Fer Terreux bleu. Blaue-eiſenerde.—This is found imbedded in clay and ſimilar earths, and often accompanies the laſt ſpecies. It occurs in Saxony, Sileſia, Swabia, Bavaria, Poland, Siberia, and the Palatinate.

Species 12. *Green Martial Earth.* Le Fer Terreux Vert. Grun-eiſenerde.—This ſpecies is uncommon, having been found only at Braunſdorf, and Schneeburg in Saxony, in veins, accompanying quartz and ſulphur pyrites.

Species 13. *Emery.* L'Emeril. Schmirgel.—This is found in Saxony, diſtributed in a bed of hardened ſteatites, in ſandſtone. It is alſo found in Italy, Spain, Peru, the iſle of Naxos in the Archipelago, where there is a cape called by the Italians, *Capo Smeriglio*, or the *Emery Cape*. It is often mixed with particles of magnetic iron ore, whence ſome have ſuppoſed the emery to be magnetic.

VII. Lead.

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Species 1. La Galéne Commune. Gemeiner-Blei-glanz.—This is the moſt common and abundant ore of lead, and is found both in primitive and ſecondary ſtrata, in beds and veins, accompanied with quartz, fluor ſpar, calcareous ſpar, ſparry iron ore, barytic earths, blende, pyrites, and ſeveral ores of ſilver. It is found in great abundance at Leadhills and at Wanlockhead in Dumfrieſſhire, in Derbyſhire, Strontian in Scotland, and in the Mendip hills in Somerſetſhire. A variety of this, called compact galena, is found in the ſame ſituations, eſpecially in Derbyſhire. It has often been confounded with *graphite*, or *plumbago*. Lead.

Werner enumerates nearly 20 formations, as he calls them, of galena, but Mr Jameſon thinks the galena formation in Dumfrieſſhire is different from any of theſe.

Species 2. *Blue Lead Ore.* La Mine de Plomb Bleue. Blau-bleierz.—This ſpecies has as yet been found only at Zſchopau in Saxony, accompanying fluor ſpar, barytic ſpar, white and black lead, and malachite.

Species 3. *Brown Lead Ore.* La Mine de Plomb Brune. Braun bleierz.—This ſpecies is alſo very rare, but is found at the ſame place with the laſt, and alſo in Bohemia, Brittany, and Hungary.

Species 4. *Black Lead Ore.* La Mine de Plomb Noire. Schwarz-bleierz.—This is found in Saxony, at Freyberg, at Zſchopau, in Cumberland, in ſome parts of Scotland, in Poland, and Siberia.

Species 5. *White Lead Ore.* La Mine de Plomb Blanche. Weiſs-bleierz.—This is not a very abundant ſpecies, but it is found in ſeveral lead mines, eſpecially in Bohemia, Saxony, the Hartz, France, Siberia, Hungary, Carinthia, and in ſome of the Britiſh lead mines, eſpecially at Leadhills.

Species 6. *Green Lead Ore.* Phoſphorated lead ore of Kirwan. La Mine de Plomb Vert. Green-bleierz. —This is found in veins, more commonly in the primitive mountains. It is met with in Bohemia, Saxony, Bavaria,

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Bavaria, Siberia, Brifgau, France, Peru, and at Leadhills in Scotland.

Species 7. *Red Lead Spar.* Le Plomb Rouge. Rothes-bleierz.—This is one of the rareft ores of lead, being as yet only found at Ekatharenburg in Siberia.

Species 8. *Yellow Lead Spar.* Le Plomb jaune. Gelbes-bleierz.—This has been known only for a few years. It has been found at Bleiberg in Carinthia, in a gangart of calcareous ftone. It has alfo been found near Freyberg in Saxony, at Annaberg in Auftria, and at Reczbanya in Hungary.

Species 9. *Native Vitriol of Lead.* Le Vitriol de Plomb natif. Naturliher-blei-vitriol.—This is found in the ifle of Anglefea, in a vein of brown iron ore, mixed with copper pyrites. It is alfo found at Leadhills in Scotland.

Species 10. *Earthy Lead Ore.*—Of this there are two varieties, the friable and the indurated. The former is found in Saxony, in Lorraine, in Poland, and Siberia, Bohemia, and Silefia: The latter is found in moft lead mines. Mr Jamefon notices two varieties of lead earth, which he calls white-lead earth, and friable lead earth, as met with at Leadhills.

VIII. Tin.

167 Tin ores.

Species 1. *Tin Pyrites.* La Pyrite d'Etain. Zinnkies. This fpecies is very rare, and is, we believe, found only in Cornwall, at Wheal rock, among *copper pyrites.*

Species 2. *Common Tinftone.* La Pierre d'Etain. Zinnftein.—This is found chiefly in primitive rocks, as in granite, gneifs, micaceous fchiftus, and porphyry, both in maffes and veins. It is the common ore of Cornwall, and is found alfo in Saxony, Bohemia, and the Eaft Indies.

Species 3. *Wood Tin Ore.* L'Etain grenu. Zinnerz.—This is found in Cornwall, in the parifhes of Colomb, St Denis and Roach, accompanying the former.

IX. Bismuth.

168 Bifmuth ores.

Species 1. *Native Bifmuth*—Bifmuth is a very rare metal, but is moft commonly found in its native ftate. It is ufually in a gangart of quartz, calcareous fpar, and barytic fpar. It occurs in Bohemia, in Saxony, in the territory of Hainault, in Suabia, in Sweden, and in France, in the mines of Brittany.

Species 2. *Sulphurated Bifmuth.* La Galéne de Bifmuth. Wifmuth Glanz.—This is very rare. It commonly accompanies the former, and is found at Joachimfthal, in Bohemia, at Johann-Georgen-ftadt, Schwarzenberg, and Altenberg in Saxony, and at Ridderhyttan in Sweden.

Species 3. *Bifmuth Ochre.* L'Ochre de Bifmuth. Wifmuth Okker.—This is ftill more rare than the laft, and is chiefly found near Schneeberg in Saxony, and at Joachimfthal in Bohemia.

X. Zinc.

169 Zinc ores.

Species 1. *Blende.* This is fulphurated zinc, and is one of the moft common ores of that metal. There are three varieties; the brown, the yellow, and the black. Of thefe the yellow is the moft rare, and is found in Saxony, in Bohemia, in the Hartz, in Norway. Tranfylvania, and Hungary. The brown and the black are found in moft of thefe places, and befides in France and England, efpecially in Derbyfhire.

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Species 2. *Calamine.* La Calamine. Galmel.—Of this there are two varieties, *compact* and *ftriated.* Both occur only in particular ftratiform rocks, often forming entire beds with indurated clay, and calcareous fpar. The latter is ufually found in the cavities of the former. Both occur in Bohemia, in Carinthia, and in moft of the German lead mines. They are alfo found in Britain, efpecially at Leadhills, Wanlock-head, and in Derbyfhire.

XI. Antimony.

170 Antimony ores.

Species 1. *Native Antimony.*—This is very rare. It was difcovered at Sahlberg in Sweden, in the year 1748, in a gangart of fome calcareous ftone, and it was alfo found fome years ago at Allemont in France, accompanying other ores of antimony and of cobalt.

Species 2. *Sulphurated Antimony.* L'Antimoine Gris. Grau-fpies glas-erz.—There are feveral varieties of this, as the compact fulphurated antimony, found at Braunfdorf in Saxony; at Goldgronach in the principality of Bareith; at Maguria in Hungary, and Auvergne in France: foliated fulphurated antimony, found at Braunfdorf and Goldgronach, and in the Hartz, and Tranfylvania: ftriated fulphurated antimony, found in Saxony, Hungary, France, Swabia, Tufcany, Sweden, the Hartz, Spain, and in England: plumofe antimonial ore, found at Freyberg in Saxony, at Braunfdorf and Stahlberg, and at Chemnitz in Hungary. All thefe varieties are ufually found in a quartzofe rock.

Species 3. *Red Antimonial Ore.* L'Antimoine Rouge. Roth-fpeis glas-erz.—This is found at Braunfdorf, at Malafka and Kremnitz, in Hungary, and at Allemont in France. It ufually accompanies the firft and fecond fpecies, efpecially at Allemont, or the next fpecies, which is the cafe at Braunfdorf.

Species 4. *Muriated Antimony.* Antimoine blanc. Weies-fpeis glas-erz.—White antimony is extremely rare; it is principally found at Przibran in Bohemia, in quadrangular, fhining tables, difpofed in bundles upon galena. It is faid alfo to have been found at Braunfdorf and Malafka.

Species 5. *Antimonal Ochre.* L'Ocre d'Antimoine. Spies glas-okker.—This fpecies is alfo very rare; it is found at Braunfdorf, near Freyberg, and in Hungary, always accompanying the fecond and third fpecies.

XII. Cobalt.

171 Cobalt ores.

Species 1. *White Colbalt Ore.* Le Cobalt blanc. Weiffer fpeis-kobolt.—This is found in Norway, Sweden, at Anaberg in Saxony, in Swabia and Stiria; but it is very rare. In Saxony and Norway, it occurs in beds of micaceous fchiftus, along with the 7th fpecies, and with quartz, hornblende, and pyrites.

Species 2. *Dull Gray Cobalt Ore.* Le Cobalt gris. Grauer-fpeis-kobolt.—This is found in Saxony, Bohemia, France, Norway, Swabia, Hungary, Stiria, and in a few mines in England. It is fometimes mixed with ores of filver.

Species 3. *Bright White Cobalt Ore.* Le Cobalt Eclatant. Glanz-kobolt.—This is the moft common of all the ores of cobalt, and almoft always accompanies the ores of nickel, and of filver. It is found in Bohemia,

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hemia, Saxony, Silesia, the Hartz, Hesse, Sweden, Swabia, Norway, Stiria, Spain, Thuringia, and in England. It is found in beds in the primitive rocks, and in veins in the secondary.

Species 4. *Black Cobalt Ochre.* Le Cobalt Terreux noir. Schwarzer-erd-kobolt.—This is found in Saxony, in Thuringia, Swabia, Hesse, the Palatinate, Saltzburg, and in the Tyrol, accompanying other ores of cobalt, and several ores of silver, copper, and iron.

Species 5. *Brown Cobalt Ochre.* Le Cobalt Terreux brun. Brauner-erd-kobolt.—This is found in considerable quantity at Saalfeld in Thuringia; at Kamsdorf in Saxony, and at Alperspach in Wirtemberg, accompanying other ores of cobalt.

Species. 6. *Yellow Cobalt Ochre.* Le Cobalt Terreux jaunne. Geber-erd-kobolt.—This is one of the rarest ores of cobalt. It is found at Saalfeld in Thuringia, at Alperspach in Wirtemberg, and at Altemont in Dauphiné in France.

Species 7. *Red Cobalt Ore.* Le Cobalt Terreux rouge. Rother-erd-kobolt. This is found in Saxony, Thuringia, Hesse, Swabia, Bohemia, Allemont in France, and in Norway.

XIII. Nickel.

172 Nickel ores.

Species 1. *Sulphurated Nickel.* Le Kupfer Nikel. Kupfer Nikkel.—This is found in veins, both in primitive and secondary mountains, almost always accompanying some of the ores of cobalt, to which it seems to bear some geological relation. It is also found in some silver mines. It is met with in Bohemia, Saxony, Thuringia, the Hartz, in Swabia, Hesse, Allemont in France, Stiria, and in some parts of Britain. Its usual gangart is quartz, barytic and calcareous spar.

Species 2. *Nickel Ochre.* L'Ocre de Nikel. Nikkel-okker.—This is found in the same situations with the last, from a decomposition of which it appears to be produced.

XIV. Manganese.

173 Manganese ores.

Species 1. *Gray Ore of Manganese.* Le Manganese. Grau-braunstein-erz.—There are several varieties of this, but they are all commonly found near each other, in veins or in masses, commonly in the primitive mountains.

They are found in considerable quantity in many mines in Saxony, Bohemia, Bavaria, and Hungary. They are also met with in France, and in several parts in Britain, as in Derbyshire, Leadhills, and Wanlockhead; in the Mendip hills, and the isle of Jura.

Species 2. *Red Manganese Ore.* Le Manganese rouge. Roth-Cronstein-erz.—This is very rare, but is found at Katnick, Offenbanya, and especially at Nagyag in Transylvania, at which last place it is found in a gold mine.

XV. Molybdena.

174 Molybdena ores.

Le Molybdene sulphure. Wasserbley.—This is found in Bohemia; at several places in Saxony; in Sweden; at Tillot in France, and at Chamouni at the foot of Mont Blanc. It is commonly found in primitive rocks, especially in tin mines.

XVI. Arsenic.

175 Arsenic ores.

Species 1. *Native Arsenic.*—This is found in Bohemia, Saxony, the Hartz, Carinthia, Swabia, Transylvania, and in France. It is always met with in veins, in primitive mountains, accompanied by realgar, galena, the ores of cobalt and nickel, and several ores of silver.

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Species 2. *Arsenical Pyrites*, or *Marcasite.* La Pyrite Arsenicale. Arsenik-kies.—This is found in Bohemia, Saxony, and Silesia, accompanying the common tin stone, and galena, with some other minerals.

Species 3. *Realgar.* Le Realgar. Rauschgelb.—This is found in the Bannat, Bohemia, Saxony, Swabia, the Hartz, the Tyrol, Hungary, and in the neighbourhood of volcanoes, especially Ætna and Vesuvius.

Orpiment, which Brochant makes a variety of realgar, is found in several of the above places, and also in Natolia, in Servia, Transylvania, and Wallachia, usually accompanying quartz and clay.

Species 4. *Native calx of Arsenic.* L'Arsenic oxidé natif. Naturlechur arsenik-kalk.—This is very rare, but is found in a small quantity in Bohemia and Joachimsthal, in Saxony, at Raschau, at Salatna, in Transylvania, and in Hungary.

XVII. Tungsten.

176 Tungsten ores.

Species 1. *Tungsten.* Le Tungsténe. Schiverstein.—This is a very rare mineral, but is found at Schlackenwald in Bohemia, at Ehrenfriederdorf in Saxony, and at Riddarkytten, Bisburg in Sweden, usually accompanying quartz, mica, talc, and tin ore.

Species 2. *Wolfram.*—This is also pretty rare, but is found in Bohemia, Saxony, and at Poldice in Cornwall.

XVIII. Uranium.

177 Uranium ores.

Species. 1. *Sulphurated Uranite.* L'Urane noir. Pecherz.—This is found at Joachimsthal in Bohemia, and at Johann-Georgen-Stadt, and Schneiberg in Saxony, accompanying the two following species, and lead and copper ores.

Species 2. *Micaceous Uranitic Ore.* L'Urane Micacé. Uran-glimmer.—This is found in the Bannat, Saxony, Wirtemberg; near Autun in France, and near Karrarach in Cornwall.

Species 3. *Uranitic Ochre.* L'Ocre d'Urane Uran-okher.—This has been found at Joachimsthal in Bohemia, and at Johann-Georgen-Stadt in Saxony, but it is uncommon.

XIX. Titanium.

178 Titanium ores.

Species 1. *Menakanite.*—This has been found chiefly near Menakan in Cornwall.

Species 2. *Titanite.* Le Ruthile. Ruthil.—This is found at Boinik and Rhonitz in Hungary; in New Castile in Spain; at Aschaffenbourg in Franconia; at St Yreiux in France, and in Mount St Gothard, and some other places in the Alps.

Species 3. *Titanitic Siliceous Ore.* Le Nigrine. Nigrin.—This has been found near St Gothard in the Alps, at Ohlapian in Transylvania, &c.

XX. Tellurium.

179 Tellurium ores.

Species 1. Sylvanite. Le Sylvane natif. Gedie-gen Sylvan.—This is found chiefly at Fatzeborg in Transylvania, but is now become extremely rare. It occurs in

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in beds of gray wacke and ſecondary (or tranſition) limeſtone.

Species 2. ——— Le Sylvane graphique. Shrifterz. —This is found at Offenbanya in Tranſylvania, in a bed of porphyritic fyenite, and granular limeſtone.

Species 3. ——— Le Sylvane blanc. Weiſs-Sylvanerz.—This was brought to Brochant from Freyberg in Saxony.

Chap. III. *Of the moſt Remarkable Theories of the Earth.*

180 Object of theories of the earth.

A late writer conſiders the proper object of a theory of the earth, to be the tracing the ſeries of thoſe revolutions which have taken place on the ſurface of the earth; to explain their cauſes, and thus to connect together all the indications of change that are found in the mineral kingdom. He juſtly obſerves, that the formation of ſuch a theory requires an accurate and extenſive examination of the phenomena of geology, and that it is inconſiſtent with any, but a very advanced ſtate of the phyſical ſciences. There is perhaps no reſearch in thoſe ſciences more arduous than this; none where the ſubject is ſo complex, where the appearances are ſo diverſified, or ſo widely ſcattered; and where the cauſes that have operated are ſo remote from the ſphere of ordinary obſervation *.

* *Playfair's Illuſtrations.*

With ſuch requiſites, and under ſuch difficulties, it is not ſurpriſing that ſo many who have aimed at conſtructing theories of the earth, have failed in the attempt. It certainly requires a prodigious accumulation of facts, together with a talent for obſervation, and for arrangement, which are ſeldom found united. We ſhall preſently ſee how far thoſe theories which have hitherto been framed to account for the changes that the earth has undergone, have been ſucceſsful.

It is not, however, to be ſuppoſed, that a correct theory of the earth is impoſſible, though ſome may think it an arrogant, if not a preſumptuous undertaking, to attempt explaining how the preſent ſtate of the globe and the revolutions which it has undergone, were brought about. The time is perhaps not far diſtant when the preſent prevailing hypotheſis will be improved into a rational, and ſo far as is conſiſtent with the knowledge and acquirements of man, a perfect ſyſtem.

Mr Kirwan has laid down certain laws of reaſoning; which ſhould be adhered to inviolably in inveſtigations of this kind. The firſt is, that no effect ſhould be attributed to a cauſe whoſe known properties are inadequate to its production. The ſecond is, that no cauſe ſhould be adduced, whoſe exiſtence is not proved either by actual experience or approved teſtimony. Many natural phenomena have ariſen or do ariſe, in times or places ſo diſtant, that well conditioned teſtimony concerning them cannot, without manifeſt abſurdity, be rejected. Thus the inhabitants of the northern parts of Europe, who have never felt earthquakes, nor ſeen volcanoes, muſt nevertheleſs admit, from mere teſtimony, that the firſt have been, and that the ſecond do actually exiſt. The third is, that no powers ſhould be aſcribed to an alleged cauſe, but thoſe that it is known by actual obſervation to poſſeſs in appropriated circumſtances.

Sect. I. *Theory of Burnet.*

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181 Theory of Burnet.

The firſt who formed this amuſement of earth-making into a ſyſtem, was the celebrated Thomas Burnet; a man of polite learning, and rapid imagination. His *ſacred theory*, as he calls it, deſcribing the changes which the earth has undergone, or ſhall hereafter undergo, is well known for the warmth with which it is imagined, and the weakneſs with which it is reaſoned; for the elegance of its ſtyle, and the meanneſs of its philoſophy. The earth, ſays he, before the deluge, was very differently formed from what it is at preſent; it was at firſt a fluid maſs; a chaos compoſed of various ſubſtances, differing both in denſity and figure; thoſe which were heavieſt ſunk to the centre, and formed in the middle of our globe a hard ſolid body; thoſe of a lighter nature remained next; and the waters, which were lighter ſtill, ſwam upon its ſurface, and covered the earth on every ſide. The air, and all thoſe fluids which were lighter than water, floated upon this alſo, and in the ſame manner encompaſſed the globe; ſo that between the ſurrounding body of waters, and the circumambient air, there was formed a coat of oil, and other unctuous ſubſtances, lighter than water. However, as the air was ſtill extremely impure, and muſt have carried up with it many of thoſe earthy particles with which it once was intimately blended, it ſoon began to defecate, and to depoſe theſe particles upon the oily ſurface already mentioned, which ſoon uniting, the earth and oil formed that cruſt which ſoon became an habitable ſurface, giving life to vegetation, and dwelling to animals.

This imaginary antediluvian abode was very different from what we ſee it at preſent. The earth was light and rich, and formed of a ſubſtance entirely adapted to the feeble ſtate of incipient vegetation; it was a uniform plain, everywhere covered with verdure, without mountains, without ſeas, or the ſmalleſt inequalities. It had no difference of ſeaſons, for its equator was in the plane of the ecliptic, or, in other words, it turned directly oppoſite to the ſun, ſo that it enjoyed one perpetual and luxuriant ſpring. However, this delightful face of nature did not long continue in the ſame ſtate, for, after a time, it began to crack and open in fiſſures; a circumſtance which always ſucceeds when the ſun exhales the moiſture from rich or marſhy ſituations. The crimes of mankind had been for ſome time preparing to draw down the wrath of heaven; and they at length induced the deity to defer repairing thoſe breaches in nature. Thus the chaſms of the earth every day became wider, and, at length, they penetrated to the great abyſs of waters, and the whole earth in a manner fell in. Then enſued a total diſorder in the uniform beauty of the firſt creation, the terrene ſurface being broken down; as it ſunk, the waters guſhed out in its place; the deluge became univerſal; all mankind, except eight perſons, were deſtroyed, and their poſterity condemned to toil upon the ruins of deſolated nature.

It remains to mention the manner in which he relieves the earth from this univerſal wreck, which would ſeem to be as difficult as even its firſt formation. Theſe great maſſes of earth falling into the abyſs, drew down with them vaſt quantities of air; and by daſhing againſt each other, and breaking into ſmall parts by

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by the violence of the ſhock, they at length left between them large cavities filled with nothing but air. Theſe cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became onee more viſible. The higher parts of its broken ſurface, now become the tops of mountains, were the firſt that appeared; the plains ſoon after came forward, and at length the whole globe was delivered from the waters, exeept the plaees in the loweſt ſituations; ſo that the ocean and the ſeas are ſtill a part of the aneient abyſs that have not had a place to return to. Iſlands and rocks are fragments of the earth's former eruſt; kingdoms and eontinents are larger maſſes of its broken ſubſtance; and all the inequalities that are to be found on the ſurface of the preſent earth, are owing to the aecidental confuſion into which both earth and waters were then thrown.

Sect. II. *Theory of Woodward.*

182 Theory of Woodward.

The next who attempted a theory of the earth was Mr Woodward, who in his eſſay towards a natural hiſtory of the earth, endeavoured to give what he conſidered as as a more rational account of its appearances than had been given by any preeeding writer. He was indeed much better qualified for ſuch an undertaking than any of his predeceſſors, as he was one of the moſt induſtrious naturaliſts of his time. Hence though his ſyſtem muſt be conſidered as weak and untenable, his work contains many important facts relating to natural hiſtory.

Woodward ſets out by aſſerting that all terreſtrial ſubſtances are diſpoſed in beds of various natures, lying horizontally, one over the other, like the coats of an onion, and that they are replete with ſhells and other marine productions; theſe ſhells being found in the deepeſt cavities, and on the tops of the higheſt mountains. From theſe obſervations, which were warranted by the experienee of naturaliſts at that time, but which we now know not to be univerſally correct, he proceeds to remark that theſe ſhells and extraneous foſſils are not productions of the earth, but are all actual remains of thoſe animals which they are known to reſemble; that all the beds of the earth lie below each other in the order of their ſpecific gravities, and that they are diſpoſed as if they had been left in this ſituation by ſubſiding waters. All this is affirmed with mueh earneſtneſs, although many of the circumſtances are contradicted by daily experienee. Thus, we not unfrequently meet with layers of ſtone above the lighteſt ſoils, and find the ſofteſt earth below a ſtratum of hard ſtone. Woodward, however, having taken for granted, that all the ſtrata of the earth are arranged in the order of their ſpecific gravities, the lighteſt at the top, and the heavieſt near the centre, he deduces as a natural conſequence, that all the ſubſtances of which the earth is compoſed were onee in an actual ſtate of ſolution. This univerſal ſolution he conceives to have happened at the time of the flood. He ſuppoſes that at that time a body of water, which was then in the centre of the earth, uniting with that which was found on the ſurface, ſo far ſeparated the terrene parts as to mix all together in one fluid maſs; the contents of whieh afterwards ſinking according to their reſpective gravities, produced the preſent appearances of the earth. Being aware, however, that an objection that foſſil ſubſtances are not found diſſolved, he exempts them from this univerſal diſſolution, and for that purpoſe, endeavours to ſhow that the parts of animals have a ſtronger eoheſion than thoſe of minerals; and that, while even the hardeſt rocks may be diſſolved, bones and ſhells may ſtill continue entire. Theories of the Earth.

Sect. III. *Theory of Whiſton.*

183 Theory of Whiſton.

Of all the theories of the earth that have been formed, previous to thoſe of Hutton and Werner, none has been more applauded or more oppoſed than that of Whiſton. Nor is this ſurpriſing; for this theory being ſupported with all the parade of mathematical caleulation, confounded the ignorant, and produeed the approbation of ſuch as deſired to be thought learned, ſince it implied a conſiderable knowledge of abſtraet ſcienee, even to be eapable of comprehending what the writer aimed at. It is not eaſy to diveſt this theory of its mathematical garb, but the reſult of our philoſopher's reaſoning appears to be as follows.

He ſuppoſes the earth to have been originally a comet, and he conſiders the hiſtory of the creation, as given us in ſcripture, to have its commencement juſt when it was, by the hand of the Creator, more regularly placed as a planet in our ſolar ſyſtem. Before that time, he ſuppoſes it to have been a globe without beauty or proportion; a world in diſorder, ſubjeet to all the viciſſitudes whieh eomets endure; ſome of which have been found, at different times, a thouſand times hotter than melted iron; at others, a thouſand times colder than iee. Theſe alternations of heat and eold, continually melting and freezing the ſurface of the earth, he ſuppoſes to have produeed, to a certain depth, a chaos entirely reſembling that deſcribed by the poets, ſurrounding the ſolid eontents of the earth, which ſtill continued unehanged in the midſt, making a great burning globe of more than two thouſand leagues in diameter. This ſurrounding chaos, however, was far from being ſolid: he compares it to a denſe though fluid atmoſphere, compoſed of ſubſtances mingled, agitated, and ſhoeked againſt each other; and in this diſorder he deſcribes the earth to have been juſt at the eve of creation.

But upon its orbit being then changed, when it was more regularly wheeled round the ſun, every thing took its proper plaee, every part of the ſurrounding fluid then fell into a ſituation, in proportion as it was light or heavy. The middle or central part, which always remained unchanged, ſtill continued ſo, retaining a part of that heat which it received, in its primeval approaehes towards the ſun; which heat he calculates, may continue for about ſix thouſand years. Next to this fell the heavier parts of the chaotic atmoſphere, whieh ſerve to ſuſtain the lighter; but as in deſcending they could not entirely be ſeparated from many watery parts with which they were intimately mixed, they drew down a part of theſe alſo with them; and theſe could not mount again after the ſurfaee of the earth was conſolidated; they therefore ſurrounded the heavy firſt deſeending parts, in the ſame manner as theſe ſurround the central globe. Thus, the entire body of the earth is compoſed internally of a great burning globe, next which is placed a heavy terrene ſubſtance that encompaſſes

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paſſes it, round which alſo is circumfuſed a body of water. Upon this body of water, the cruſt of the earth on which we dwell is placed, ſo that, according to him, the globe is compoſed of a number of coats, or ſhells, one within the other, all of different denſities. The body of the earth being thus formed, the air, which is the lighteſt ſubſtance of all, ſurrounded its ſurface, and the beams of the ſun darting through, produced that light which, we are told, firſt obeyed the Creator's command.

The whole economy of the creation being thus adjuſted, it only remained to account for the riſings and depreſſions on the ſurface of the earth, with the other ſeeming irregularities of its preſent appearance. The hills and valleys are conſidered by him as formed by their preſſing upon the internal fluid, which ſuſtains the outward ſhell of earth with greater or leſs weight; thoſe parts of the earth which are heavieſt, ſink into the ſubjacent fluid more deeply, and become valleys; thoſe that are lighter, riſe higheſt upon the earth's ſurface, and are called mountains.

Such was the face of nature before the deluge; the earth was then more fertile and populous than it is at preſent; the life of man and animals was extended to ten times its preſent duration; and all thoſe advantages aroſe from the ſuperior heat of the central globe, which ever ſince has been cooling. As its heat was then in full power, the genial principle was alſo much greater than at preſent; vegetation and animal increaſe were carried on with more vigour; and all nature ſeemed teeming with the ſeeds of life. But theſe phyſical advantages were only productive of moral evil; the warmth which invigorated the body, increaſed the paſſions and appetites of the mind; and as man became more powerful, he grew leſs innocent. It was found neceſſary to puniſh this depravity; and all living creatures were overwhelmed by the deluge in univerſal deſtruction.

This deluge, which ſimple believers are willing to aſcribe to a miracle, philoſophers have been long deſirous to account for by natural cauſes. They have proved that the earth could never ſupply from any reſervoir towards its centre, nor the atmoſphere by any diſcharge from above, ſuch a quantity of water as would cover the ſurface of the globe to a certain depth over the tops of our higheſt mountains. Where, therefore, was all this water to be found? Whiſton has found enough, and more than a ſufficiency, in the tail of a comet; for he ſeems to allot comets a very active part in the great operations of nature.

He calculates with great ſeeming preciſion, the year, the month, and the day of the week on which this comet (which has paid the earth ſome viſits ſince, though at a kinder diſtance) involved our globe in its tail. The tail he ſuppoſed to be a vaporous fluid ſubſtance, exhaled from the body of the comet, by the extreme heat of the ſun, and increaſing in proportion as it approached that great luminary. It was in this that our globe was involved at the time of the deluge; and as the earth ſtill acted by its natural attraction, it drew to itſelf all the watery vapours which were in the comet's tail; and the internal waters being alſo at the ſame time let looſe, in a very ſhort ſpace the tops of the higheſt mountains were laid under the deep.

The puniſhment of the deluge being thus completed and all the guilty deſtroyed, the earth, which had been broken by the eruption of the internal waters, was alſo enlarged by it; ſo that upon the comet's receſs, there was found room ſufficient in the internal abyſs for the receſs of the ſuperfluous waters, whither they all retired, and left the earth uncovered, but in ſome reſpects changed, particularly in its figure, which, from being round, was now become oblate. In this univerſal wreck of nature Noah ſurvived, by a variety of happy cauſes, to repeople the earth, and to give birth to a race of men ſlow in believing ill-imagined theories of the earth.

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Sect. IV. *Theory of Buffon.*

184 Theory of Buffon.

Less abſtracted and more popular than the theory of Whiſton, but equally fanciful and pompous, was the hypotheſis of Buffon. This ſyſtem, which was received with great admiration, depends principally on two facts which, though generally true, were by Buffon extended much too far.

It had been long obſerved, that ſuch flinty or ſiliceous bodies as form a part of the compoſition of glaſs, are among the moſt abundant materials which compoſe the earth, and that many of them nearly reſemble glaſs in colour, tranſparency, luſtre, hardneſs, and ſpecific gravity. As glaſs is produced by fuſion in a ſtrong heat, it was inferred by Buffon, that the flinty bodies found on the earth derived their origin from a ſimilar fuſion; and as no heat ſufficient to produce ſo great an effect, could be found on our globe, the author has recourſe to the ſun as its ſource. He ſuppoſes the planets, and the earth among the number, to have originally formed a part of the body of the ſun. In this ſituation a comet falling in on that great body, might have given it ſuch a ſhock, and ſo ſhaken its whole frame, that ſome of its particles might have been driven off, like ſtreaming ſparkles from red-hot iron; and each of theſe ſtreams of fire, though very ſmall in compariſon of the ſun, might have been large enough to form a planet much greater than our earth, or any other of the planetary ſyſtem. In this manner the planets, together with the globe which we inhabit, might have been driven off from the body of the ſun by impulſion; and in this way they would have continued to recede from it for ever, had they not been arreſted by the ſuperior power of attraction, exerted on them by the ſun; and thus, by the combination of the centrifugal and centripetal forces, they were whirled round in the orbits which they now deſcribe.

After giving a number of reaſons for the credibility, or at leaſt poſſibility, of the foregoing ſuppoſition, the author concludes that it is evident, that the earth aſſumed its preſent figure when in a melted ſtate. It is natural to think, ſays he, that the earth, when it iſſued from the ſun, had no other form but that of a torrent of melted and inflamed matter; that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a ſpheroid; that, when the earth cooled, the vapours, which were expanded like the tail of a comet, gradually condenſed, and fell down in the form of water upon the ſurface, depoſiting at the ſame time a ſlimy ſubſtance mixed with ſulphur and ſalts, part of which was carried by the motion of the waters into the perpendicular fiſſures of the ſtrata, and

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produced metals, and the reſt remained on the ſurface, and gave riſe to the vegetable mould which abounds in different places, with more or leſs of animal or vegetable particles, the organization of which is not obvious to the ſenſes.

Thus the interior parts of the globe were originally compoſed of vitrified matter, and probably they are ſo at preſent. Above this were placed thoſe bodies which had been reduced by the heat to the ſmalleſt particles, as ſand, which are only portions of glaſs, and above theſe pumice ſtones, and the ſcoriæ of melted matter, from which were afterwards produced the ſeveral kinds of clay. The whole maſs was covered with water to the depth of five or ſix hundred feet, ariſing from the condenſation of the vapours when the earth began to cool. This water depoſited a ſtratum of mud, mixed with all thoſe ſubſtances which were capable of being ſublimed, or exhaled by fire; and the air was formed of the moſt ſubtile vapours, which, from their ſmall ſpecific gravity, floated above the water.

Such was the condition of the earth, when the tides, the winds, and the heat of the ſun, began to introduce changes on its ſurface. The diurnal motion of the earth, and that of the tides, elevated the waters in the equatorial regions, and neceſſarily tranſported thither great quantities of ſlime, clay, and ſand; and by thus elevating thoſe parts of the earth, they perhaps ſunk thoſe under the poles about two leagues, or a 230th part of the whole; for the waters would eaſily reduce into powder pumice ſtones, and other ſpongy parts of the vitrified matter upon the ſurface; and by this means excavate ſome places and elevate others, which, in time, would produce iſlands and continents, and all thoſe inequalities on the ſurface, which are more conſiderable towards the equator than towards the poles. The higheſt mountains lie between the tropics and the middle of the temperate zones, and the loweſt from the polar circles towards the poles. Indeed, both the land and ſea have moſt inequalities between the tropics, as is evident from the incredible number of iſlands peculiar to theſe regions.

The other circumſtance which forms a principal part of the baſis of this theory, is derived from the compoſition of ſea ſhells. It is well known that theſe ſhells conſiſt chiefly of an earth like that which conſtitutes the principal part of limeſtone or marble; and it was hence inferred that, after a ſeries of ages, theſe ſhells being broken down into minute particles, produced thoſe immenſe maſſes of calcareous ſubſtances which are now found either in vaſt mountains, or in ſtratified plains, in almoſt every part of the earth.

Buffon conceives very naturally, that the ſurface of the earth muſt, at the beginning, have been much leſs ſolid than it is at preſent, and conſequently the ſame cauſes which at this day produce but ſlight changes, muſt then, on ſo yielding a body, have been attended with very conſiderable effects. There is, he thinks, every reaſon to ſuppoſe, that the earth was at that time covered with the waters of the ſea; and that theſe waters were above the tops of our higheſt mountains, ſince, even in ſuch elevated ſituations, we find ſhells and other marine productions in very great abundance. It appears alſo that the ſea continued for a conſiderable time upon the face of the earth; for as theſe layers of ſhells are found ſo very frequently at ſuch great depths, and in ſuch prodigious quantities, it ſeems impoſſible for ſuch numbers to have been ſupported all alive at one time; ſo that they muſt have been brought there by ſucceſſive depoſitions. Theſe ſhells alſo are found in the bodies of the hardeſt rocks, where they could not have been depoſited all at once, at the time of the deluge, or at any ſuch inſtant revolution; ſince that would be to ſuppoſe, that all the rocks in which they are found were, at that inſtant, in a ſtate of diſſolution, which would be abſurd to aſſert. The ſea, therefore, depoſited them wherever they are now to be found, and that by ſlow and ſucceſſive degrees.

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"It will appear alſo, that the ſea covered the whole earth, from the appearance of its layers, which lying regularly one above the other, ſeem all to reſemble the ſediment formed at different times by the ocean. Hence, by the irregular force of its waves and its currents, driving the bottom into ſand-banks, mountains muſt have been gradually formed within this univerſal covering of waters; and theſe ſucceſſively raiſing their heads above its ſurface, muſt, in time, have formed the higheſt ridges of mountains upon land, together with continents, iſlands, and low grounds, all in their turns. This opinion will receive additional weight by conſidering, that in thoſe parts of the earth, where the power of the ocean is greateſt, the inequalities on the ſurface of the earth are higheſt; the ocean's power is greateſt at the equator, where its winds and tides are moſt conſtant; and in fact, the mountains at the equator are found to be higher than in any other parts of the world. (Vid. N° 129.). The ſea, therefore, has produced the principal changes in our earth; rivers, volcanoes, earthquakes, ſtorms, and rain, having made but ſlight alterations, and only ſuch as have affected the globe to very inconſiderable depths."

"In the formation of this theory, ſays Mr Kirwan, 185
genius (I mean genius in its primitive ſenſe, the ſublime talent of faſcinating invention, and not the energetic power of patient, profound, and ſagacious inveſtigation), unhappily preſided. Yet dazzled by the ſplendid but deluſive ſcenery, preſented by an ardent imagination ſoaring to the ſource of light, and rending from its flaming orb the planetary maſſes that ſurround it; then marking with daring and overweening confidence, fancied ſucceſſive epochs of the conſolidated fabric of the terraqueous globe; the public attention was long arreſted by the magical repreſentation, and the underſtanding nearly betrayed into a partial, if not a total, aſſent to it.

"This proud gigantic theory was, however, like another Goliath, ſoon demoliſhed by a common flint or pebble, the very ſubſtance it ſprung from. Common glaſs eſſentially contains an alkaline ſalt, to which alone it owes its fuſibility; ſiliceous ſubſtances contain none, and are abſolutely infuſible when unaſſociated with any. Macquer found them infuſible not only in furnaces, but in the ſtill incomparably ſuperior heat of inflamed oxygen. Hence the hypotheſis grounded on the aſſumed identity of theſe ſubſtances and common glaſs, vaniſhed like the unembodied viſions of the night. With reſpect to limeſtone, the other pillar on which this theory reſts, Cronſtedt, Ferber, Born, Arduini, and Bergman, demonſtrated the exiſtence of numerous and immenſe mountains, in which not only no veſtiges of ſhells could be traced, but whoſe internal ſtructure of

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position was incompatible with the ſuppoſition of an origination thence derived." *

* *Kirwan's Geological Eſſays.*

Sect. V. *Theory of Whitehurſt.*

156 Theory of Whitehurſt.

The firſt perſon who founded a theory of the earth on accurate and induſtrious obſervation was the late Mr John Whitehurſt, who, in an inquiry into the original ſtate and formation of the earth, has advanced opinions which differ conſiderably from thoſe of preceding naturaliſts, and in ſome meaſures reſemble thoſe which are at preſent in greateſt repute.

Mr Whitehurſt ſets out with ſtating his opinions, that the terraqueous globe, which we now inhabit, was originally in a fluid ſtate, and this, not from any ſolvent principle or ſubſequent ſolution, but owing to the firſt aſſemblage of its component parts; whence he preſumes that the earth had a beginning, and has not exiſted from eternity. He reſts his proof of this original fluid ſtate of the earth on its ſpheroidal form, which a fluid globe in its revolution would naturally acquire, but which could not eaſily be produced in a ſolid body. The fluidity of the earth and the infinite diviſibility of matter, an opinion which generally prevailed at that time, prove, according to him, that the component parts of the elements were uniformly blended together, none being heavier or lighter than another; hence they compoſed a uniform maſs of equal conſiſtence throughout, from the ſurface to the centre, and conſequently the new formed globe was not adapted to the ſupport of animal or vegetable life. It would therefore be abſurd to ſuppoſe, that organized bodies were created during the chaotic ſtate of the earth; and there is a great preſumption that mankind were not created till the earth was become ſuitable to the nature of their exiſtence.

The component parts of the chaos were heterogeneous, and endowed with peculiar chemical affinities, whereby ſimilar ſubſtances were diſpoſed to unite and form ſelect bodies of various denominations, and thus the chaos was progreſſively formed into a habitable world.

The firſt operation of nature which preſents itſelf to our conſideration is the production of the ſpheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force. When this form was once completed, the component parts began to act on each other according to their affinities: hence the particles of earth, air, and water, united to thoſe of their own kind, and with their union commenced their ſpecific gravities; and the uniform ſuſpenſion which had hitherto prevailed throughout the whole of the chaotic maſs, was deſtroyed.

On the component parts ſeparating into homogeneous maſſes, thoſe of the greateſt denſity began to approach towards the centre of gravity, and thoſe of the greateſt levity aſcended towards the ſurface. As the ſpecific gravity of air is ſo much leſs than that of water, it is preſumed that the former eſcaped from the general maſs ſooner than the latter, and formed an impure atmoſphere ſurrounding the newly-formed globe. Water being next in levity, ſucceeded the air, and formed one vaſt ocean about the earth. In proceſs of time theſe elements became perfectly pure, and fit for the preſervation of animal and vegetable life.

When the component parts of the chaos had been thus progreſſively ſeparated, and collected into diſtinct maſſes, the following conſequences are ſuppoſed to have enſued. The ſolids could not uniformly ſubſide from every part of the ſurface, and be equally covered by water; for, as the ſun and moon were coeval with the chaos, in proportion as the ſeparation of the ſolids and fluids increaſed, ſo, by the action of thoſe bodies on the ſea, the tides became greater, and removed the ſolids from place to place, without any order or regularity. Hence the ſea became unequally deep; and thoſe inequalities daily increaſing, dry land gradually appeared, and divided the waters which had hitherto been univerſally diffuſed over the earth. The primitive iſlands being thus formed, gradually became firm and dry, and fit for the reception of animals and vegetables. Theories of the Earth.

The atmoſphere, the ſea, and the land, being thus formed, Mr Whitehurſt proceeds to conſider the order in which animal and vegetable bodies were ſeverally created. He firſt ſuppoſes that, as the ocean became pure, and fit for animal life, before the formation of the primitive iſlands, fiſh were the firſt animals produced, and he ſupports this opinion by many ingenious arguments and facts. He obſerves, that in every inſtance upon record, the fragments of ſea-ſhells are infinitely more numerous than the bones and teeth of fiſh. The latter, too, are but rarely depoſited in any other matter than in beds of ſand and gravel, and not in the ſolid ſubſtance of limeſtone, as the ſhells of fiſh generally are, even to the depth of many hundred yards, and diſperſed throughout the whole extent of the ſecondary ſtrata. Hence it is probable, that ſhell-fiſh were produced in prodigious quantities, ſooner than any other kind of animal. The ocean being thus ſtocked with inhabitants, previous to the formation of the primitive iſlands, many of them became enveloped, and were buried in the mud by the action of the tides; and this would happen more particularly to the ſhell-fiſh, as they were leſs able to extricate themſelves. Since the remains of marine animals are thus imbedded at various depths in the earth, there is ſufficient proof that theſe marine bodies were entombed at ſucceſſive periods of time, and that they were likewiſe created before the primitive iſlands, and conſequently before any terreſtrial iſlands.

That the earth has, at different times, ſuffered very violent convulſions, producing extenſive ruptures of its ſolid parts, may reaſonably be concluded from the rugged and uncouth appearance of many of the mountainous parts of the world. We ſee rocks in ſome places torn aſunder, or appearing as if cut with a ſaw, and we find, in various parts, ſubſtances both mineral and organized, which are not generally met with, except in very diſtant regions. Moſt of the irregularities of the earth's ſurface are attributed by Mr Whitehurſt to the general deluge. This would, in ſome inſtances, have the effect of reducing large maſſes of matter to a ſecond ſtate of ſolution; many eminences would be levelled, and ſome of the valleys would be filled up, while ſome parts which were before covered with water, might receive ſuch an acceſſion of matter as to fill up their cavities, and on the ſubſiding of the waters become a vaſt level plain. On the other hand, thoſe elevated regions which were chiefly compoſed of the hardeſt ſtones, by having the lighter portions of earth waſhed

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away from their baſis, would appear conſiderably increaſed in height. Mr Whitehurſt attributes the production of pit coal alſo to the deluge, as it is difficult to account for the depoſition of ſuch a quantity of vegetable matter (ſuppoſing pit-coal to be of vegetable origin) below the ſurface of the earth, on any other hypotheſis. The animal matters found in a foſſil ſtate, eſpecially thoſe remains of animals which are not now found upon the earth, can only be accounted for, on the ſuppoſition of a deluge.

Mr Whitehurſt, however, is not content with attributing to the deluge moſt of the changes which have taken place on the ſurface of the earth, but he derives from the ſame ſource the curtailed longevity of man, and many of the evils incident to mankind. "At that dreadful era, ſays he, and not before, the year became divided into ſummer and winter, ſpring and autumn, and the ſpontaneous products of the earth no longer ſufficed the calls of human nature without art and labour; wherefore he who ſowed would expect to reap, and he who built an hut for his protection, would naturally expect to enjoy the fruits of his own labour; neceſſity, therefore, was the parent of property, and property created a thouſand imaginary wants, which its poſſeſſors endeavoured to gratify, and their example excited ſimilar ideas in thoſe who had it not, but nevertheleſs ſtudiouſly endeavoured to gratify their artificial wants by unjuſtifiable means. Hence the neceſſity of laws, dominion, and ſubordination, which had no exiſtence in the antediluvian world.

"To that great revolution in the natural world, we may therefore aſcribe many of the evils incident to mankind; for experience ſhews, that men who are born n rude and ſavage climates are naturally of a ferocious diſpoſition; and that a fertile ſoil, which leaves nothing to wiſh for, ſoftens their manners, and inclines them to humanity."

The above is a general outline of Mr Whitehurſt's theory, ſome parts of which are very ingenious, and are corroborated by obſervation, while others are not a little fanciful and improbable. In his ſuppoſition that the earth was originally in a fluid ſtate, he agrees with moſt other theoriſts, as this is a circumſtance which admits of little doubt; though, as Kirwan has ſhewn, it is not neceſſary to ſuppoſe that the whole maſs of the earth was fluid, but only thoſe parts of it which are near the ſurface. In his play of affinities, and conſequent ſeparation of the materials of the earth into homogeneous maſſes, Whitehurſt has been followed by Mr Kirwan, who has framed a beautiful and ingenious ſpeculation on the ſucceſſive changes that took place from the action of the materials on each other ‡.

‡ *Kirwan's Geological Eſſays*, Eſſay 1. 187

Mr Whitehurſt has been betrayed by his fondneſs for a favourite theory, into ſeveral errors reſpecting the ſtratification of the earth, which require to be mentioned. Thus, though the arrangement of the ſtrata, eſpecially where it has not been diſturbed by ſome evident and violent cauſe, is extremely uniform; he has, however, extended this regularity farther than it really obtains. He tells us that the ſtrata invariably follow each other, as if it were in an alphabetical order, or a ſeries of numbers, whatever be their denomination. Not that they are alike in all the different regions of the earth, either in quality or in thickneſs, but that their order in each particular part, however they may differ in quality; yet they follow each other in regular ſucceſſion, both as to thickneſs and quality, inſomuch, that by knowing the incumbent ſtratum, together with the arrangement thereof in any particular part of the earth, we may come to a perfect knowledge of all the inferior beds, ſo far as they have been previouſly diſcovered in the adjacent country. With reſpect to the ſtrata that accompany coal, ſome inſtances are apparently, but not really, contradictory to this rule.

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We now know, however, that Mr Whitehurſt's obſervations do not univerſally apply. In the old mines in the valley of Planen, in Saxony, the ſtrata, though they are near each other, vary conſiderably in thickneſs, from that of a few inches to ſeveral feet, and the ſtratum of coal, in particular, varies from two to thirty-two feet. Again, in Mount Salive, the ſtrata of coal, though in a calcareous mountain, vary conſiderably; and Mr Whitehurſt himſelf informs us, that at Benſal moor, thoſe ſtrata which are in other places the loweſt, are found at the ſurface. Even in Derbyſhire, to which Mr Whitehurſt's obſervations chiefly apply, we are informed that even when the arrangement is the ſame, the thickneſs of the ſtrata varies conſiderably.

Sect. VI. *Theory of Dr Hutton.*

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The next theory which we have to conſider, is that propoſed by Dr James Hutton, which has become ſo much the object of inquiry and debate, as to give name to one of the two principal ſects into which geologiſts are now divided.

The leading principles of the Huttonian theory, as conciſely laid down by one of its greateſt admirers and ſupporters, are the following.

1. The firſt circumſtance which Dr Hutton has conſidered as a general fact is, that by far the greater part of the bodies which compoſe the exterior cruſt of our globe, bear the marks of being formed of the materials of mineral and organized bodies, of more ancient date. The ſpoils or the wreck of an older world are, he thinks, everywhere viſible in the preſent, and though not found in every piece of rock, they are diffuſed ſo generally as to leave no doubt that the ſtrata which now compoſe our continents are all formed out of ſtrata more ancient than themſelves.

2. The preſent rocks, with the exception of ſuch as are not ſtratified, having all exiſted in the form of looſe materials collected at the bottom of the ſea, muſt have been conſolidated and converted into ſtone by virtue of ſome very powerful and general agent. The conſolidating cauſe which he points out is ſubterraneous heat, and the objections to this hypotheſis have been attempted to be removed, by the introduction of a principle new and peculiar to himſelf. This principle is the compreſſion which muſt have prevailed in that region where the conſolidation of mineral ſubſtances was accompliſhed. Under the weight of a ſuperincumbent ocean, heat, however intenſe, might be unable to volatilize any part of thoſe ſubſtances which, at the ſurface, and under the lighter preſſure of our atmoſphere, it can entirely conſume. The ſame preſſure, by forcing thoſe ſubſtances to remain united, which at the ſurface are eaſily ſeparated, might occaſion the fuſion of ſome bodies which in our fires are only calcined.

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3. The third general circumſtance which this theory is founded on is, that the ſtratified rocks, inſtead of being either horizontal or nearly ſo, as they no doubt were originally, are now found poſſeſſing all degrees of elevation, and ſome of them were perpendicular to the horizon; to which we muſt add, that thoſe ſtrata which were once at the bottom of the ſea, are now raiſed up, many of them ſeveral thouſand feet above its ſurface. From this, as well as from the inflexions, the breaking and ſeparation of the ſtrata, it is inferred, that they have been raiſed by the action of ſome expanſive force placed under them. This force, which has burſt in pieces the ſolid pavement on which the ocean reſts, and has raiſed up rocks from the bottom of the ſea into mountains 15,000 feet above its ſurface, exceeds any which we ſee actually exerted, but ſeems to come nearer to the cauſe of the volcano or the earthquake than to any other, of which the effects are directly obſerved. The immenſe diſturbance, therefore, of the ſtrata, is in this theory aſcribed to heat acting with an expanſive power, and elevating theſe rocks which it had before conſolidated.

4. Among the marks of diſturbance in which the mineral kingdom abounds, thoſe great breaches among rocks, which are filled with materials different from the rock on either ſide, are among the moſt conſpicuous. Theſe are the veins, and comprehend not only the metallic veins, but alſo thoſe of whinſtone, of porphyry, and of granite, all of them ſubſtances more or leſs cryſtallized, and none of them containing the remains of organized bodies. Theſe are of poſterior formation to the ſtrata which they interſect, and in general alſo they carry with them the marks of the violence with which they have come into their place, and of the diſturbances which they have produced on the rocks already formed. The materials of all theſe veins, Dr Hutton concludes to have been melted by ſubterraneous heat, and while in fuſion, injected among the fiſſures and openings of rocks already formed, but thus diſturbed, and moved from their original place.

This concluſion he extends to all the maſſes of whinſtone, porphyry, and granite, which are interſperſed among the ſtrata, or raiſed up in pyramids, as they often appear to be, through the midſt of them. Thus, in the fuſion and injection of the unſtratified rocks, we have the third and laſt great operation which ſubterraneous heat has performed on mineral ſubſtances.

5. From this Dr Hutton proceeds to conſider the changes to which mineral bodies are ſubject when raiſed into the atmoſphere. Here he finds, without any exception, that they are all going to decay; that, from the ſhore of the ſea to the top of the mountain, from the ſofteſt clay to the hardeſt quartz, all are waſting and undergoing a ſeparation of their parts. The bodies thus reſolved into their elements, whether chemical or mechanical, are carried down by the rivers to the ſea, and are there depoſited. Nothing is exempted from this general law; among the higheſt mountains and the hardeſt rocks, its effects are moſt clearly diſcerned; and it is on the objects which appear the moſt durable and fixed, that the characters of revolution are moſt deeply imprinted *.

* *Edinburgh Phil. Tranſ.* vol. v. P. iii. p. 52.

It is not ſurpriſing that this theory ſhould have met with many advocates among the more ſuperficial obſervers of nature. The production of a man in whom genius, obſervation, and induſtry, were united, and who paſſed a conſiderable part of a long life in chemical and geological reſearches, was calculated to dazzle the imagination by the grandeur of its deſign, and to captivate the judgment by its appearance of regularity and conſiſtence. It has been conſidered as a peculiar excellence of this theory, that it aſcribes to the phenomena of geology an order ſimilar to that which exiſts in the provinces of nature with which we are beſt acquainted; that it produces ſeas and continents, not by accident, but by the operation of regular and uniform cauſes; that it makes the decay of one part ſubſervient to the reſtoration of another, and that it gives ſtability to the whole, not by perpetuating individuals, but by reproducing them in ſucceſſion *.

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* *Playfair's Illuſtrations*, p. 129.

189 Objections to the Huttonian theory.

An hypotheſis with ſuch pretenſions could not fail of being minutely examined and ſeverely criticiſed by the more enlightened part of geologiſts, and accordingly very ſerious objections have been made to it by Kirwan and others. We ſhall ſtate a few of what appear to us to be the moſt convincing arguments againſt Dr Hutton's theory, referring thoſe who wiſh to ſee a more detailed refutation of it to the geological writings of Kirwan, and A Comparative View of the Huttonian and Neptunian Theories.

190 From the nature and action of caloric.

Some of the ſtrongeſt arguments againſt this theory are drawn from the nature of caloric, and what we know of its action on other bodies. We know that caloric is of ſo diffuſible a nature, that it is always communicated, from that body or ſet of bodies, in which it is moſt abundant, to that in which it is leſs ſo, till an equilibrium of temperature is produced. But Dr Hutton's theory ſuppoſes a ſubterraneous heat as conſtantly exiſting, capable of fuſing the moſt obdurate rocks, and of raiſing them by its expanſibility from the bottom of the ocean, and yet incapable of extending its influence through the ſuperincumbent ſtrata at all times, ſo as to fuſe or evaporate ſuperior bodies, and gradually expand itſelf, ſo as to acquire that equilibrium which is one of its natural effects. Again, ſuppoſing ſuch a ſubterraneous heat to exiſt, it is ſurely extraordinary, that ſubſtances which we are incapable of fuſing by the ſtrongeſt heat that we can excite, even in the greateſt ſtate of diviſion, ſhould, by this ſubterraneous heat be ſo completely fuſed, and in ſuch vaſt maſſes, as to have aſſumed the appearance under which they now preſent themſelves. If the ſolar rays, in the utmoſt ſtate of concentration, if a united ſtream of inflamed hydrogenous and oxygenous gaſes from the tube of a blow-pipe or gazometer, cannot melt the ſmalleſt viſible portion of calcareous ſpar or rock cryſtal, how can we conceive that the immenſe mountains of limeſtone and of quartz which are met with in ſo many places could have been fuſed into a ſtate of perfect fluidity? Or even if they could be fuſed, how is it poſſible that the carbonic acid of the limeſtone ſhould not have been diſſipated by ſo ſtrong a heat? If we ſuppoſe with Dr Hutton, that this ſubterraneous heat acts with the aſſiſtance of immenſe preſſure from the ſuperincumbent ſtrata and waters of the ocean, hence preventing the diſſipation of volatile matters, ſtill it ſhould act uniformly, and ſhould fuſe all thoſe bodies which come in its way, that are capable of fuſion. Now, we know that feldſpar, ſchorl, mica, and chlorite, are much more fuſible than quartz, and of courſe, when a maſs compounded of theſe comes under

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under the influence of this heat, all theſe more fuſible ſubſtances ſhould be melted as well as the quartz. But in ſome ſtones in which moſt of theſe ingredients meet, as in the granite of Portſoy, there is every reaſon to ſuppoſe that ſome of them have been in a fluid ſtate, while the others were ſolid or leſs fluid, as cryſtals of the latter are impreſſed on a bed of the former, viz. in the inſtance cited, cryſtals of feldſpar in a maſs of quartz. As it is certain, according to the advocates of the Huttonian theory, that at leaſt the quartz was fluid when it was moulded on the feldſpar, how happened it that this comparatively fuſible ſtone was not alſo melted, and blended in one compact maſs with the quartz? We alſo frequently find cryſtals of quartz penetrated by ſchorl and chlorite, which is a proof that the latter muſt have been hard while the former was in a fluid ſtate. Hence it is evident that theſe appearances could not have been the effect of fuſion by heat. Again, we find ſeams of coal penetrated by thin laminæ and cryſtals of quartz, an effect which, according to this theory, muſt have taken place while the quartz was in a ſtate of fuſion. But, in this caſe, the ſtrata of ſhale above and below the coal ſhould alſo have been fuſed (ſhale being much more fuſible than quartz), and thus the whole ſhould have acquired a ſlaty texture; and beſides in this intenſe heat, the coal ſhould have been entirely charred and loſt all its vegetable impreſſions.

The very exiſtence of ſuch a ſubterraneous heat, that conſtantly maintains itſelf without fuel, ready to act on any emergency, when a quantity of the old world has been abraded and tranſlated, ſufficient to furniſh the materials of a new one, is avowedly hypothetical, as we have no proof that it exiſts. Nay, we have direct proof, as far as rational induction can carry us, to the contrary. It was long ago obſerved, by Irving and Forſter, that the heat of the ſea diminiſhes in proportion to the depth to which we proceed in examining it, and the ſame has been more lately proved by Peron, by various trials in many different latitudes *. Now the contrary of this ought certainly to happen, (unleſs this ſubterraneous heat is entirely unlike common heat) if there conſtantly exiſted in the bowels of the earth a heat capable of fuſing quartz and limeſtone.

* *Journ. de Phyſ.* tom. lx. p. 81.

The ſtructure of whin dykes, detailed in Section II. of laſt Chapter, affords additional arguments in oppoſition to the Huttonian theory.

191 From the ſtructure of whin dykes.

The evidence which Dr Hutton has adduced to prove the ſubterraneous eruption of dykes, is drawn from the apparent derangement of the horizontal ſtrata at a place where they are interſected by a dyke, and the peculiar appearance of the coal in their immediate vicinity, which he ſuppoſes to be in a ſtate of calcination, from having been in contact with the ejected matter of the dyke in fuſion. Let us firſt attend to the effect of this eruption of a dyke, the apparent derangement of the ſtrata; and let us conſider for a moment, what muſt be the mechanical operation of a maſs of this liquid matter burſting upwards through the coal ſtrata. Suppoſe a coal field of a mile ſquare in extent; ſuppoſe that the coal and concomitant ſtrata are perfectly regular, having a moderate *dip* or inclination to the ſouth; and ſuppoſe that this coal field is to be interſected by a dyke, ejected in a ſtate of fuſion from the bowels of the earth. Conſidering the nature of the ſtrata which uſually accompany coal, ſuch as ſandſtone, limeſtone, ironſtone, &c. which are very hard and compact, we muſt allow, that the reſiſtance from ſuch ſubſtances would be very great. In this previous ſtate of circumſtances, then, what would be the effect of the eruption of a dyke in the middle of the field, in a direction from north to ſouth? Can it even be imagined, that this liquid maſs in its progreſs upwards through the ſuperincumbent ſtrata to the ſurface of the earth, would merely deſtroy the continuity of theſe ſtrata, and not in its irreſiſtible courſe, carry along with it part of all the ſubſtances compoſing that ſtrata through which it paſſed? But farther, one of the moſt obvious conſequences of ſuch an eruption, would be the elevation of part of the whole range of the ſtrata on both ſides of the dyke, and the extent of this elevation will be in proportion to the power or thickneſs of the dyke; and, not only is it natural to expect this elevation of the ſtrata to a certain extent, but from the operation of an agent ſo tremendous and irreſiſtible, that the whole ſtrata ſhould be broken, disjointed, and confuſed. But does this ſtatement correſpond with the phenomena? From the hiſtory of dykes traverſing coal ſtrata, we know that it does not. On the contrary, the whole of the ſtrata, in moſt caſes, preſerve the ſame thickneſs, the ſame parallelifm, and the ſame inclination to the horizon on both ſides of the dyke. It is true, the half mile of coal field, interſected by a dyke, as we have ſuppoſed above, will on one ſide of it be elevated or depreſſed. If the dyke, which runs north and ſouth in its courſe upwards, inclines to the weſt, the weſtern diviſion will be elevated. But this is not a partial elevation only in the immediate vicinity of the dyke. It extends over the whole field on the weſt ſide of the dyke, and the ſtrata continue fair and regular, in all reſpects correſponding to thoſe from which they have been detached, till they are interſected by another dyke.

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From this reaſoning, we think the concluſion fair and obvious, that dykes interſecting coal ſtrata have not been formed by ſubterraneous eruption, and therefore, that the elevation or depreſſion of the ſtrata is not owing to this cauſe. Dr Hutton's theory, in this reſpect, is oppoſed by the facts which it profeſſes to explain, and conſequently it is untenable.

Let us now conſider the argument drawn from the ſuppoſed calcination of the coal which has been in contact with the matter of the dyke in a ſtate of fuſion. Here Dr Hutton ſeems to have overleaped the bounds of his own theory, and loſt ſight of his own principles, which ſuppoſe, that all the ſtrata and ſtony matters of which the globe is compoſed, have been conſolidated by means of heat; that the exhibition of the common or ordinary phenomena of heat is not to be looked for in the grand proceſſes of nature; becauſe theſe operations have taken place at great depths in the bowels of the earth, or under immenſe preſſure at the bottom of the ſea; and this is the reaſon that coal, and lime ſtrata, for inſtance, which have been ſubjected to this intenſe degree of heat diſcover no marks of calcination, the one being deprived of its carbonic acid, and the other of its bitumen. Now, granting this hypothetical argument to be well founded, what is the reaſon that the coal, which is in contact with a dyke, has undergone the proceſſes of calcination, when this coal is at as great a depth in the bowels of the earth, under as immenſe preſſure, and as much

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much excluded from atmoſpheric air, as any coal at its original formation. But all the coal in contact with a dyke, is not in this ſtate. Clean coal is ſometimes found in immediate contact; and, in many places, clean coal is alſo found intercepted between regular ranges of baſaltic columns, and this coal diſcovers not the ſmalleſt mark of calcination. On the other hand, coal in this ſuppoſed ſtate of calcination, has been frequently diſcovered, at a great diſtance from any dyke or baſaltic ſubſtance whatever. Maſſes of this foul coal often occur, to the regret and diſappointment of the miner, in the midſt of ſtrata otherwiſe perfectly clean and regular. This laſt fact ſhews us, that we muſt look for the cauſe of this ſingular phenomenon elſewhere than in the circumſtance of the coal having been in contact with a dyke while in fuſion; for it appears that the effect does not always follow in the ſame circumſtances, and that the ſame effect is produced in very different circumſtances.

These obſervations are probably ſufficient to ſhew that the above argument in proof of the ſubterraneous eruption of dykes, is equally unſatisfactory in explaining the phenomena, and conſequently equally untenable with the former. Both, therefore, muſt fall to the ground.

102 From the ſtructure of metallic veins.

The wedge-like form of dykes might be addueed as another argument againſt their formation by ſubterraneous eruption; for it is not eaſy to conceive that a dyke in a ſtate of fuſion ſhould, in its eruptive progreſs towards the ſurface of the earth, enlarge and become thicker.

The hiſtory of metallic veins furniſhes us with ſtronger objections againſt Dr Hutton's theory. If, according to this theory, metallic veins have been formed by the ſubſtances they contain being ignited in a ſtate of fuſion from the bowels of the earth, it will naturally follow, that the veins thus formed might be traced to the greateſt depths, and even to the ſubterraneous furnace from which they iſſued. But we know that the fact is quite otherwiſe. The termination of many veins downwards has been diſcovered. Even the moſt powerful and productive have been unexpectedly cut off by the horizontal ſtrata, and no veſtige of them could ever be traced. This was the caſe with the rich vein of lead ore at Llangunog in Wales. It is the caſe alſo with many veins in their courſe downwards, to diminiſh gradually in form of a wedge, and then they are loſt for ever. Now, this certainly could never have happened, had they been formed by ſubterraneous eruption. Some trace of their progreſs, ſome mark of their courſe through the interſected ſtrata, would ſtill have remained. But no ſuch indications, no ſuch traces, are found. We muſt therefore conclude, that metallic veins have not been formed in this way, and that this theory, which appears to be ſo much at variance with facts, will not account in a ſatisfactory manner for their formation.

The maſſes of ſtone of the ſame ſpecies with the neighbouring ſuperior ſtrata, ſometimes rounded and worn by the action of water, which are found at great depths in mineral veins, and organized ſubſtances, petrifactions of vegetables and animals, preſent us with another objection to this theory, equally ſtrong and inſurmountable. Theſe ſubſtances are the productions of the ſurface of the earth; and even ſuppoſing them to have exiſted in the bowels of the earth, it is inconceivable that they ſhould have retained their primitive form after they were ſubjected to ſo high a temperature as is neceſſary to hold metals in a ſtate of fuſion.

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Sect. VII. *Theory of Werner.*

103 Theory of Werner.

The lateſt, and perhaps moſt celebrated, theory that has yet appeared, is that of Profeſſor Werner of Freyberg, with an account of which, and ſome obſervations on Mr Kirwan's opinions, we ſhall cloſe this chapter.

We have ſaid already, (N° 1.) that the ſubject of which we are now treating is called by Werner *geognoſy*, and his pupils are commonly called *geognoſts*.

Werner is of opinion, that our knowledge is already ſufficiently advanced to form a rational theory reſpecting the formation of the *exterior cruſt* of our globe; for he does not deny that we cannot reaſon with reſpect to what is below this, ſince we have no fact which can give us the leaſt notion with reſpect to it. We are only certain that ſome part of our globe has been in a fluid ſtate, as is proved by its ſpheroidal form. The cryſtalline form of granite and other rocky ſubſtances which conſtitute the baſe of that part of the earth with which we are acquainted, are, according to Werner, ſufficient proofs that this part at leaſt has been in a ſtate of minute diſſolution. Again, the ſtratified appearance of moſt mountains and rocks ſhew that they are an accumulation of precipitates or ſediments which have been depoſited one over another. The numerous remains of marine animals which are found imbedded in many rocks, and of which ſome ſpecies are ſtill found in our ſeas, allow us to believe that this ſolution was aqueous; that it was a vaſt ocean which has covered our globe to a very conſiderable height. *The exterior part of the globe*, then, *has been entirely diſſolved by the waters which ſurrounded it, and from this ſolution certain chemical precipitations took place, which have formed the cruſt that we now ſee.*

In framing his theory, Werner profeſſes to baniſh every thing that is hypothetical, and only to draw from general facts ſuch immediate conſequences as he believes it impoſſible not to deduce from them, and on theſe alone he founds his geognoſy. The object of this theory, according to one of his diſciples (the tranſlator of his book on metallic veins), is to acquire a knowledge of the ſtructure of the ſolid cruſt of the terraqueous globe, and the relative diſpoſition of the materials which compoſe it; the means of doing this are to be derived from obſervation. Werner ſets out with ſtating, that the chemical precipitates that took place from the chaotic fluid, did not form a regular ſurface, but that they collected here and there ſo as to produce the primitive mountains. Theſe mountains he calls chaotic, becauſe, ſays he, they have been formed during the period when the ſurface of the earth was a ſort of chaos. After the retreat of the waters, theſe elevated parts were firſt diſcovered. They were expoſed to the deſtructive action of the elements, and the ſhock of tides and torrents. The valleys were hollowed out, and the mountains acquired nearly the form in which we now ſee them.

Obſervation has ſhewn that the ſtrata of which the earth is compoſed, may be divided into a certain number of congeries, each of which is compoſed of a certain

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tain ſet of minerals that are nearly the ſame in whatever part of the world the congeries is found. To theſe congeries Werner has given the name of formations, of which he diſtinguiſhes ſix kinds or claſſes, four univerſal, being found all over the globe, and two partial, found only in particular diſtricts. Theſe formations he has arranged according to the order in which he conceives them to have been produced, beginning with that formation which lies next the ſolid nucleus of the earth, and which may therefore be conceived to be the oldeſt, and ending with the moſt ſuperficial, which is conſidered as the neweſt formation.

The firſt of theſe claſſes is called by Werner that of *primitive formations*, which conſiſt of a number of formations lying above each other, being thoſe which are ſuppoſed the oldeſt, as in theſe no organic remains have been diſcovered. The ſubſtances conſtituting this claſs are *granite*, *gneiſs*, *micaceous ſchiſtus*, *argillaceous ſchiſtus*, *primitive limeſtone*, *primitive trap*, *ſyenite*, and *porphyry*. Of theſe the granite is the loweſt, and therefore is conſidered as the oldeſt; and next this follow the others in the order in which we have enumerated them, except that the primitive limeſtone, and primitive trap, are found in an uncertain order, alternating with gneiſs, argillaceous ſchiſtus, or micaceous ſchiſtus; and are therefore conſidered as ſubordinate to theſe formations.

When the waters had ſubſided, and the ſummits of the primitive mountains had been uncovered, organized bodies were produced; and part of theſe being intercepted among the chemical precipitations which were ſtill going on, and the mechanical precipitations which now began to take place, were carried with theſe to the flanks of the primitive mountains, and the valleys between them. Hence were produced a ſecond ſeries of formations, which are called by Werner *tranſition formations*, or *rocks of tranſition*, as he conſidered them to be depoſited during the period when the earth was paſſing from an uninhabited to an inhabited ſtate. Among theſe formations, however, the organic remains are but few. The ſubſtances compoſing this claſs, are *tranſition limeſtone*, *gray wacke*, *gray wacke ſlate*, *tranſition trap*, *ſiliceous ſchiſtus*. Of theſe the two laſt are ſubordinate, alternating with gray wacke and gray wacke ſlate.

The third formation is what Werner calls *floetz formation*, or that, in which the beds or ſtrate lie nearly horizontal, appearing as if they had been depoſited from water. This formation comprehends moſt of what are uſually called ſecondary ſtrata. It is divided by Werner into three ſubformations, named from the variety or ſituation of the ſandſtone, which forms a principal part of each; as, 1. Old red ſandſtone formation, compoſed of *floetz limeſtone*, *old red ſandſtone*, and *foliated gypſum*. 2. Second ſandſtone formation, compoſed of *ſandſtone*, *floetz limeſtone*, and *fibrous gypſum*. 3. Third ſandſtone formation, compoſed of *ſandſtone*, *limeſtone*, and *chalk*, &c. Of theſe, as before, the firſt mentioned is the oldeſt, and in this, ſomewhere near the gypſum, there is uſually found ſalt or ſulphur. In this formation, organic remains are firſt ſeen in any great quantities.

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The fourth formation is called *independent coal formation*, becauſe in this coal is firſt found, and becauſe it is not univerſally ſpread over the earth as the three preceding, but is collected in inſulated maſſes, independent of each other. This is alſo divided into three, each ſucceſſively more recent than the preceding. The firſt ſeries of ſtrata conſiſt of *ſlate clay*, *limeſtone*, *marl*, *ſoft ſandſtone*, *greenſtone*, *argillaceous ironſtone*, *ſhale*, and *coal*; the ſecond of *indurated clay*, *marl*, *limeſtone*, *porphyritic ſtone*, and *coal*; and the third of *looſe ſandſtone*, *conglomerate*, (a variety of ſandſtone), *ſlate clay*, and *coal*.

The fifth is called *floetz ſtrap formation*, ſo called becauſe the *beds* of which it is compoſed, conſiſt of materials that are moſtly of the nature of *trap*, or whinſtone. The ſubſtances that compoſe this formation are *gravel*, *ſandſtone*, *ſiliceous ſandſtone*, *clay*, *wacke*, *baſalt*, *greenſtone*, *ſchiſtoſe porphyry*, *pitchſtone*, and *grayſtone*. *Coal* is alſo found in this formation, ſomewhere among the beds of *ſiliceous ſandſtone*, *clay*, *wacke*, and *baſalt*, to which it is therefore conſidered as ſubordinate (F).

The ſixth and laſt formation is the *alluvial formation*, or that which has ariſen from the action of lakes and rivers, waſhing down part of the older ſtrata. This is divided into two ſeries of ſtrata; the firſt being thoſe that have ariſen from the action of lakes newly drained, comprehending *marl*, *ſand*, *clay*, and *coal*; and the ſecond, thoſe which have been produced from the action of rivers, comprehending *mud*, *ironſtone*, *ſand*, *peat*, &c. This formation is the moſt recent of any, but, like the fourth, it is only partial.

The above is an outline of Werner's geognoſy, which is conſidered as an improvement of what is called the *Neptunian theory*, or that which explains geological appearances by the action of water, in oppoſition to what is called the *volcanic theory*, or that which attributes theſe appearances to an igneous origin.

194 Objections to the theory of Werner.

One of the principal objections to the Neptunian theory is drawn from the inſolubility in water of many of the ſubſtances which compoſe our globe; but this the Neptunians endeavour to explain, by ſuppoſing that at the very commencement of their exiſtence theſe ſubſtances were in that ſtate of minute diviſion which aqueous ſolutions require, but which no known exiſting quantity would be able to effect, after the ſubſtances had acquired their utmoſt conſolidation, as it is well known, that a ſolid ſubſtance may be kept in ſolution, at leaſt for a ſhort time, in a leſs quantity of fluid than was originally requiſite to diſſolve it.

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(F) We may here notice Werner's opinion with reſpect to the formation and ſituation of baſalt; as this is the only theory of importance reſpecting it, that has not been mentioned under the article BASALTES. "I am perfectly convinced (ſays Werner in a late memoir) that all the varieties of baſalt have been produced in the humid way, and that they are of a very recent formation; that they formerly compoſed a great bed of immenſe extent, covering both the primitive and ſecondary ſtrata; that time has anew deſtroyed a conſiderable part, and has left only the baſaltic eminences which we now ſee." Vid. *Jameſon's Mineralogy of Dumfries*, p. 184.

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A ſecond objection is derived from the difficulty of ſuppoſing that theſe ſubſtances could have been conſolidated below water, or that the water could completely ſhut up the pores of a body, to the entire excluſion of itſelf; ſo that had the mineral ſubſtances been conſolidated as here ſuppoſed, the ſolvent ought either to remain within them in a liquid ſtate, or, if evaporated, ſhould have left the pores empty, and the body pervious to water.

Mr Playfair argues ſtrenuouſly againſt the notion of theſe ſubſtances being precipitated from the chaotic fluid, which has been ſo ingeniouſly ſupported by Kirwan, who aſcribes the ſolution of all ſubſtances in the chaotic fluid to their being finely pulveriſed, or created in a ſtate of the moſt minute diviſion; and the ſolvent being then inſufficient in quantity, he ſuppoſes that, on that account, the precipitation took place the more rapidly.

"If, ſays Mr Playfair, he means by this to ſay, that a precipitation without ſolution would take place the ſooner, the more inadequate the menſtruum was to diſſolve the whole, the propoſition may be true, but will be of no uſe to explain the cryſtallization of minerals, the very object he has in view; becauſe to cryſtallization it is not a bare ſubſidence of particles ſuſpended in a fluid, but it is a paſſage from chemical ſolution to non-ſolution, or inſolubility, that is required.

"If on the other hand he means to ſay, that the ſolution actually took place more quickly, and was more immediately followed by precipitation, becauſe the quantity of the menſtruum was inſufficient, this is to aſſert that the weaker the cauſe, the more inſtantaneous will be its effect*."

*Playfair's Illuſtrations, ſect. 161.

195 Werner's theory of dykes and veins.

Werner's theory of dykes and veins requires a more particular conſideration.

This theory ſuppoſes, that the ſpaces which are now occupied by vertical ſtrata, or dykes, including alſo metallic veins, were originally fiſſures, formed by the operation of different cauſes.

1. The unequal height and denſity of mountains, are conſidered as the moſt general cauſes of fiſſures. When the mountains were in a ſoft and humid ſtate, that ſide which was leaſt ſupported not only ſeparated by its own weight, but the whole ſtrata of the ſide gave way, and ſunk below their former plain. This alſo ſeems to be the opinion of Sauſſure, with regard to the formation of fiſſures. It is not to be expected, that events of this kind ſhould be of frequent occurrence, now that mountains have acquired ſufficient firmneſs and ſtability to reſiſt the force of gravity, operating in conſequence of the inequality of weight and diverſity of the materials of which they are compoſed. Inſtances, however, of the operation of ſuch cauſes are not altogether wanting, even in modern times. After a ſeaſon of exceſſive rains, in the year 1767, ſimilar fiſſures were formed in mountains in Bohemia and Luſatia.

2. When the waters covered the ſurface of the earth, the unequal weight of the mountains was ſupported by their preſſure; but when the waters retreated, this preſſure was removed, the equilibrium was deſtroyed, the unſupported ſide of the mountain ſeparated and ſunk; and in this manner a fiſſure was formed.

3. The evaporation of the moiſture, after the retreat of the waters, and the conſequent diminution of bulk by contraction of the ſubſtances which enter into the compoſition of mountains, are alſo conſidered as the cauſes of fiſſures.

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4. Fiſſures, too, derive their origin from other local and accidental cauſes, and eſpecially from earthquakes. In the year 1783, when Calabria was afflicted with this moſt dreadful of all calamities which viſit the earth, mountains were ſeparated, exhibiting fiſſures ſimilar to thoſe which are now occupied by vertical ſtrata.

The ſecond part of the theory is employed in proving that the empty ſpaces, occaſioned by the operation of one or other of the cauſes which have been enumerated, were filled from above; that the different ſubſtances, of which the vertical ſtrata are compoſed, were held in ſolution by the waters which covered the earth; and that they were precipitated, by different chemical agents, according to the order of chemical affinity, and depoſited in the places which they now occupy. In ſupport of the opinion, that theſe fiſſures were filled from above, Werner adduces facts of angular and rounded fragments of ſtones of various ſpecies, and organized bodies, as marine ſhells and vegetables, having been found in vertical ſtrata, at the immenſe depth of 150 and 200 fathoms. It may be doubted, on good grounds, whether this theory, ſupported by all the ingenuity and experience of its author, will account in a ſatisfactory manner, for that regularity of poſition and arrangement which are diſcovered in the vertical ſtrata; for, notwithſtanding the ſeeming diſorder which a ſuperficial vein may exhibit, they are not leſs regular and uniform than the horizontal ſtrata. And when our reſearches are extended beyond the narrow bounds within which they are at preſent limited, when we are better acquainted with their relative poſitions and connexions, this uniformity and regularity will become more conſpicuous. It may be doubted whether the fortuitous operation of ſuch cauſes as have been ſtated, be equal to the effect of the formation of the vertical ſtrata, as they now appear.

But, ſuppoſing that fiſſures were produced by ſome of the cauſes which have been mentioned, few of theſe cauſes could operate till the retreat of the waters left the mountains uncovered. It was only then that the mountains, by the inequality of height and denſity, being left unſupported, ſeparated, and ſunk from their former ſituation; it was then only that the proceſs of evaporation could take place, ſucceeded by diminution of bulk and conſequent contraction. In ſhort, none of the cauſes which have been ſtated, could have any effect before the waters had retreated, excepting earthquakes; of the operation of which there is no proof previous to that period. The materials which compoſe the vertical ſtrata, it is ſaid, were formed by depoſition from the waters which covered the mountains, holding them in ſolution. But before the fiſſures could be formed to receive theſe materials by precipitation and depoſition, the waters had retired. A ſecond deluge muſt therefore have happened, from the waters of which the various ſubſtances which enter into the compoſition of vertical ſtrata have been depoſited. This the theory does not ſuppoſe to have taken place; and, without ſuch a ſuppoſition, it ſeems to be attended with conſiderable difficulty. But another difficulty ſtill remains. It does not appear how the peculiarity of

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ſtructure, which was mentioned in our account of whin dykes, Sect. II. of the laſt chapter, can be accounted for by the principles of this theory. If it be granted, that the horizontal ſtrata were formed in the humid way, the materials of which they are compoſed muſt have been precipitated from the waters which held them in ſolution, by the laws of chemical affinity. But the vertical ſtrata are ſuppoſed to have been formed in the ſame manner, and according to the ſame proceſs. Now, this being the caſe, What is the reaſon that the vertical ſtrata ſhould exhibit a peculiarity of ſtructure and arrangement, different from the horizontal ſtrata? Some of the whin dykes which have been already deſcribed, are very remarkable for this ſingular ſtructure, eſpecially thoſe which aſſume the form of priſmatic columns. Theſe columns are in the horizontal poſition; and, excepting the latter circumſtance, theſe dykes, in every reſpect, reſemble a baſaltic ſtratum, in which the columns are perpendicular.

More arguments might be adduced in oppoſition to the theory of Werner; but we muſt haſten to conclude this chapter, with mentioning a few of Mr Kirwan's peculiar opinions.

196 Kirwan's theory of the declivities of mountains.

Among theſe, the manner in which he accounts for the unequal declivities of the ſides of mountains, forms one of the moſt conſpicuous objects: and to this we ſhall principally confine ourſelves, and ſhall give it in his own words, as extracted from his eſſay on the declivities of mountains, to which we were obliged in the firſt ſection of Chap. II.

"To aſſign the cauſes of this almoſt univerſal allotment of unequal declivities to oppoſite points, and why the greateſt are directed to the weſt and ſouth, and the gentleſt, on the contrary, to the eaſt and north, it is neceſſary to conſider,

"1. That all mountains were formed while covered with water.

"2. That the earth was univerſally covered with water at two different eras, that of the creation, and that of the Noachian deluge.

"3. That in the firſt era we muſt diſtinguiſh two different periods, that which preceded the appearance of dry land, and that which ſucceeded the creation of fiſh, but before the ſea had been reduced nearly to its preſent level. During the former, the primeval mountains were formed; and during the latter, moſt of the ſecondary mountains and ſtrata were formed.

"4. That all mountains extend either from eaſt to weſt, or from north to ſouth, or in ſome intermediate direction between theſe cardinal points, which need not be particularly mentioned here, as the ſame ſpecies of reaſoning muſt be applied to them, as to thoſe to whoſe aſpect they approach moſt.

"Theſe preliminary circumſtances being noticed, we are next to obſerve that, during the firſt era, this vaſt maſs of water moved in two general directions, at right angles with each other, the one from eaſt to weſt, which needs not to be proved, being the courſe of tides which ſtill continue, but were in that ocean neceſſarily ſtronger and higher than at preſent; the other from north to ſouth, the water tending to theſe vaſt abyſſes then formed in the vicinity of the ſouth pole, as ſhewn in my former eſſays. Before either motion could be propagated, a conſiderable time muſt have elapſed.

"Now the primeval mountains formed at the commencement of the firſt era, and before this double direction of the waters took place, muſt have oppoſed a conſiderable obſtacle to the motion of that fluid in the ſenſe that croſſed that of the direction of theſe mountains. Thus the mountains that ſtretch from north to ſouth muſt have oppoſed the motion of the waters from eaſt to weſt; this oppoſition diminiſhing the motion of that fluid, diſpoſed it to ſuffer the earthy particles with which in thoſe early periods it muſt have been impregnated, to cryſtallize or be depoſited on theſe eaſtern flanks, and particularly on thoſe of the higheſt mountains, for over the lower it could eaſily paſs; theſe depoſitions being inceſſantly repeated at heights gradually diminiſhing as the level of the waters gradually lowered, muſt have rendered the eaſtern declivities or deſcent, gentle, gradual, and moderate, while the weſtern ſides receiving no ſuch acceſſions from depoſitions, muſt have remained ſteep and craggy.

"Again, the primeval mountains that run from eaſt to weſt, by oppoſing a ſimilar reſiſtance to the courſe of the waters from north to ſouth, muſt have occaſioned ſimilar depoſitions on the northern ſides of theſe mountains, againſt which theſe waters impinged, and thus ſmoothed them.

"Where mountains interſect each other in an oblique direction, the north-eaſt ſide of one range being contiguous to the ſouth-weſt flanks of another range, there the influx of adventitious particles on the north-eaſt ſide of the one, muſt have frequently extended to the ſouth-weſt ſide of the other, particularly if that afflux were ſtrong and copious; thus the *Erzgebirge* of Saxony, which run from weſt to eaſt, have their north-eaſt ſides contiguous to the ſouth-weſt ſide of the Rieſengebirge that ſeparate Sileſia from Bohemia, and hence theſe latter are covered with the ſame beds of gneiſs, &c. as the northern ſides of the Saxon, and thereby are rendered ſmooth and gentle, comparatively to the oppoſite ſide, which, being ſheltered, remains ſteep and abrupt, which explains the ſeventh obſervation.

"The cauſes here aſſigned explain why the covering of adventitious ſtrata on the higheſt mountains is generally thineſt at the greateſt height, and thickeſt towards the foot of the mountain; for the bulk of the water that contained the adventitious particles being proportioned to its depth, and the maſs of earthy particles with which it was charged being proportioned to the bulk of the water that contained them, it is plain, that as the height of water gradually decreaſed, the depoſitions from it on the higher parts of the mountains muſt have been leſs copious than on the lower, where they muſt have been often repeated.

"Hence, 2. granite mountains, generally the moſt ancient, frequently have their northern or eaſtern ſides covered with ſtrata of gneiſs or micaceous ſchiſtus, and this often with argillite or primeval ſandſtone, or limeſtone, theſe being either of ſomewhat later formation, or longer ſuſpendible in water.

"Hence, 3. different ſpecies of ſtone are often found at different heights of the ſame flank of a mountain, according as the water which conveyed theſe ſpecies, happened to be differently impregnated at different heights. During the firſt era its depoſitions formed the primitive ſtony maſſes; after which the creation of fiſh, limeſtone, ſandſtone, (*pudding ſtone*) and ſecondary argillites, in which piſcine remains are found, were depoſited.

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ted. But during the ſecond era, that of the Noachian deluge, by reaſon of the violence and irregularity of its aggreſſion, the depoſitions were more miſcellaneous, and are found at the greateſt heights; yet in general they may well be diſtinguiſhed by the remains of land animals, or of vegetables, or of both, which they preſent in their ſtrata (or at leaſt by the impreſſions of vegetables which they bear) as theſe muſt have been conveyed after the earth had been inhabited. But mountains regularly ſtratified bearing ſuch remains, for inſtance the carboniferous, cannot be deemed to have been formed in a period ſo tumultuous. During this deluge the waters alſo held a different courſe, proceeding at firſt from ſouth to north, and afterwards in both oppoſite directions, as ſhewn in treating of that cataſtrophe in my ſecond eſſay.

"Hence, and from various contingent local cauſes, as partial inundations, earthquakes, volcanoes, the eroſion of rivers, the elapſion of ſtrata, diſintegration, the diſruption of the lofty mounds by which many lakes were anciently hemmed in, ſeveral changes were produced in particular countries, that may at firſt ſight appear, though in reality they are not, exceptions to the operations of the general cauſes already ſtated.

"Thus the mountains of Kamtſchatka had their eaſtern flanks torn and rendered abrupt by the irruption of the general deluge, probably accompanied by earthquakes. And thus the Meiſſener had its eaſt and north flanks undermined by the river Warre, as Werner has ſhewn; thus the eighth and ſixteenth obſervations are accounted for, as is the thirteenth by the vaſt inundations ſo frequent in this country, (1. *Pallas*, p. 172.), which undermined or corroded its eaſt ſide, while the weſtern were ſmoothed by the calcareous depoſitions from the numerous rivers in its vicinity.

"Hence, 4. we ſee why on different ſides of lofty mountains different ſpecies of ſtones are found, as Pallas and Sauſſure have obſerved (2. *Sauſſ.* § 981.), a circumſtance which Sauſſure imagined almoſt inexplicable, but which Dolomieu has ſince happily explained, by ſhewing that the current which conveyed the calcareous ſubſtances to the northern, eaſtern, and north-eaſtern ſides of the Alps, for inſtance, was ſtopped by the height of theſe mountains, and thus prevented from conveying them to the ſouthern ſides, and thus the north-eaſtern ſides were rendered more gentle than the oppoſite, (3. *New Roz.* p. 423.), conformably to the theory here given.

"Hence, 5. where ſeveral lofty ridges run parallel to each other, it muſt frequently happen that the external ſhould intercept the depoſitions that do not ſurround them, and thus leave the internal ridges ſteep on both ſides.

"Hence, 6. low granitic or other primitive hills are frequently uncovered by adventitious ſtrata on all ſides, as at Phanet in the county of Donegal, or are covered on all ſides; the impregnated waters either eaſily paſſing over them, or ſtagnating upon them, according to the greater or leſs rapidity of its courſe, and the obſtacles it met with."

197 Kirwan's theory of dykes.

Mr Kirwan's theory of the formation of whin dykes, is as follows.

He ſuppoſes that the dyke exiſted in the ſpot where it is found previous to the formation of the horizontal ſtrata; that, during the formation of the latter by depoſition, their equal extenſion on each ſide of the dyke was obſtructed by its height preventing the paſſage of the current of waters; that the ſtrata on that ſide of the dyke which were firſt formed, occaſioned a much more conſiderable preſſure than on the ſide on which the ſtrata of latter formation repoſe, and muſt have pulled the upper and more moveable extremity of the ſlip gradually towards the ſide on which there was leaſt preſſure; on that ſide it muſt therefore overhang: this preſſure being of earlier date than on the oppoſite ſide, muſt have had a more conſiderable effect in depreſſing each particular ſtratum, and forcing their integrant particles into cloſer contact, than could have been produced in thoſe of later formation; and conſequently the ſtrata muſt be lower. The ingenious author has added, with good reaſon, that he is not ſatisfied with this explanation. It is undoubtedly quite incompatible with the phenomena which it attempts to explain. For it has been already obſerved, that the coal and contiguous ſtrata are, in every reſpect, the ſame on both ſides of a dyke, to whatever diſtance they may have been elevated or depreſſed, which demonſtrates clearly, that their formation muſt have been coeval. But, beſides, the ſame derangement takes place in a ſlip where there is merely a ſolution of contiguity of the horizontal ſtrata, one ſide being only elevated or depreſſed above or below the correſponding ſide from which it has been detached without having a vertical ſtratum or dyke interpoſed.

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Chap. IV. *Of Earthquakes and Volcanoes.*

198 In the preceding chapters we have given a ſhort account of the materials which conſtitute the globe of the earth; we have taken a view of the relative poſition and connexion which ſubſiſt among theſe materials, ſo far as they are known, and we have conſidered ſome of the changes which are ſuppoſed to have taken place in their arrangement and diſtribution, and ſome of the theories which have been propoſed to account for theſe changes. We have hitherto contemplated nature in a ſtate of ſeeming repoſe, conducting her operations by a gradual and ſilent proceſs, and accompliſhing the moſt beneficial and wonderful effects, unheeded and unobſerved. We are now to take a view of thoſe more terrible and ſudden changes which are exhibited in the deva ſtation and ruin which accompany the earthquake and the volcano;—changes awful in the contemplation, but dreadful and terrible in their tremendous effects.

Many of the phenomena which accompany earthquakes and volcanoes, are common to both. Earthquakes are frequently the forerunners, and ſometimes the attendants, of volcanic eruptions; but earthquakes have often exiſted, and their terrible effects have been ſeverely felt, where no volcano was ever known.

In the preſent chapter, we propoſe to conſider the phenomena, hiſtory, and cauſes of earthquakes and volcanoes, which will form the ſubjects of the two following ſections. In the firſt we ſhall treat of earthquakes, and in the ſecond of volcanoes.

Sect. I. *Of the Phenomena and Hiſtory of Earthquakes.*

199 Places where earthquakes prevail.

Earthquakes have been felt in moſt countries of the world. There are, however, particular places, which

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which ſeem to be more ſubject to this dreadful calamity than others; and this does not ſeem to depend on any local circumſtances, with regard to particular regions of the earth. It may be obſerved in general, that earthquakes are more frequent within the tropics; but there are places within the torrid zone, which are more rarely viſited by earthquakes than ſome of the more temperate, or even the colder regions of the earth. In the iſlands of the Weſt Indies, and in ſome parts of the American continent which lie between the tropics, the earthquake is more frequently felt than in moſt other regions of the earth. But the northern ſhores of the Mediterranean, the kingdom of Portugal, and ſome other places without the tropics, have been oftener the ſcene of deſolation, by the effects of the earthquake, than many of the iſlands and extenſive continents within the torrid zone. From this circumſtance in the hiſtory of earthquakes, it would appear that they are not limited to particular regions, on account of proximity to the equator or diſtance from it, on account of inſular ſituation or extent of continent. Particular iſlands, however, and particular parts of continents, have undoubtedly been oftener viſited by earthquakes than others. Of all the iſlands of the Weſt Indies, Jamaica has moſt frequently experienced their dreadful effects. Indeed, ſcarcely a year paſſes, without ſeveral ſhocks of an earthquake being felt in that iſland. Mexico and Peru in South America, are more ſubject to earthquakes than the other regions of the American continent. Portugal has been often ſhaken to the very foundations, by terrible earthquakes, while Spain, immediately adjoining, or it may be ſaid, including it, is, comparatively, almoſt exempted from their effects. It has been obſerved, that earthquakes have been leſs deſtructive in Italy than in Sicily, which are in the immediate vicinity of each other, and are both volcanic countries.

Obſervations on phenomena ſo awful and terrible, can ſcarcely be expected to be very numerous. The operation of the cauſes which produce them is too rapid, the effects are too ſudden and unexpected, to be rendered the ſubject of accurate or attentive philoſophical inveſtigation; or, perhaps, we might acknowledge at once, that they are too extenſive and too obſcure for the powers of man. They are beyond the graſp of the human mind.

It has been already obſerved, that earthquakes are more frequent in volcanic countries than in any others. In theſe regions they are oftener dreaded and expected than in other places. Where a volcano exiſts, and when it has ceaſed to throw out flame and ſmoke for any long period, ſhocks of earthquakes begin to be dreaded. This has been very generally the caſe with the principal volcanoes of the world, the events of whoſe hiſtory have been recorded. An earthquake is often the forerunner of an eruption, and the very firſt warning of its approach.

200 Phenomena which precede and accompany them.

Earthquakes are often preceded by long droughts. The earthquake, however, does not immediately ſucceed the ceſſation of the drought, or the fall of rain. Some electrical appearances are obſerved to take place in the air, before the earthquake comes on. The aurora borealis is frequent and brilliant, and bright meteors are often ſeen darting from one region of the heavens to another, or from the atmoſphere to the earth.

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Before the ſhock comes on, the waters of the ocean appear to be unuſually troubled; without the effect of wind, or any perceptible cauſe, it ſwells up with great noiſe. Fountains and ſprings are alſo greatly diſturbed, and their waters are agitated, and become muddy. The air at the time of the ſhock has been obſerved to be remarkably calm and ſerene, but afterwards it becomes dark and cloudy.

The noiſe which accompanies the ſhock of an earthquake is ſometimes like that of a number of carriages, driving along the pavement of a ſtreet with great rapidity. Sometimes it is like a ruſhing noiſe, ſimilar to that of wind, and ſometimes it reſembles the exploſions occaſioned by the firing of artillery. The noiſe which accompanied the earthquake, which was pretty generally felt over Scotland about three years ago, we recollect, reſembled that of a heavy perſon walking rapidly, and barefooted, through an adjoining room.

The effect of earthquakes on the ſurface of the earth is various. Sometimes it is inſtantaneouſly heaved up in a perpendicular direction; and ſometimes aſſumes a kind of rolling motion, from ſide to ſide. Sometimes the ſhock commences with the perpendicular motion, and terminates with the other.

Great openings or fiſſures are made in the earth by the ſhock, and theſe in general throw out vaſt quantities of water, but ſometimes ſmoke and flame are alſo emitted. Flame and ſmoke are often ſeen iſſuing through the ſurface of the earth, even where no chaſm or fiſſures has been produced.

The effects of an earthquake on the ocean are not leſs terrible than thoſe on land. The ſea ſwells up to a great height; its waters ſometimes ſeem to be entirely ſeparated, and from the place of ſeparation, currents of air, ſmoke, and flame, are diſcharged. Similar effects have been obſerved to take place in lakes, ponds, and rivers. Their waters are thrown into great agitation, and are ſometimes ſwelled up. Places in which there was a conſiderable body of water, have become dry land, and dry land has been converted into an extenſive lake by the ſhock of an earthquake.

The moſt terrible earthquake that has yet viſited the earth, has never been felt over its whole ſurface. Their effects, however, extend to very diſtant regions, from the centre or principal ſcene of deſolation. The exiſtence of an earthquake is indicated much more extenſively by water than by land. Where its effects have not been at all perceived on dry land, the agitation produced on the waters in the ocean, or in lakes and rivers, has been often communicated to a very great diſtance.

The duration of the ſhock of an earthquake rarely exceeds a minute, and perhaps very few continue for near that length of time. But the ſhocks are ſometimes repeated in rapid ſucceſſion; and perhaps from the effect on the ſenſes, and the dread and alarm which are thus occaſioned, it is ſuppoſed that their duration is much longer than it really is.

But as no general account of the phenomena which accompany an earthquake, from the difficulty or ſcantineſs of obſervation, can be complete, it will be rendered much more intelligible and intereſting, if we enter a little

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little more into the detail of the hiſtory of particular earthquakes; and in the account of ſome of them which we propoſe to lay before our readers, it will be found that moſt of the appearances and effects which have been enumerated, were obſerved.

201 Earthquake in Calabria in 1638.

The firſt earthquake, the hiſtory of which we ſhall now detail, happened in Calabria, in the year 1638. This earthquake is rather to be conſidered as an exception to what was ſaid with regard to their not taking place in the neighbourhood of a volcano, ſoon after an eruption. The volcanoes in that vicinity had experienced violent eruptions a very ſhort time before. Five years before, there had been an eruption of Mount Veſuvius, and two years only had elapſed from the time that a ſimilar event had befallen Ætna. This mountain, indeed, at the very time, threw out a great body of ſmoke, which ſeemed to cover the whole iſland, and entirely concealed the ſhores from view. The air over the ſea at a little diſtance was calm and ſerene, and the ſurface of the water was perfectly ſmooth. Seemingly without any cauſe, it began to be ſlightly agitated, as happens to the ſurface of water in a heavy ſhower of rain. A dreadful noiſe ſucceeded, and the ſmell of ſulphureous vapours was perceived. The noiſe, like the rattling of chariots, grew more frequent and loud, and the ſhock at laſt was terribly felt, when the earth was heaved up, or rolled in the form of waves.

This earthquake is particularly deſcribed by the celebrated father Kircher. "On the 24th of March, (ſays he), we departed in a ſmall boat from the harbour of Meſſina in Sicily, and the ſame day arrived at the promontory of Pelorus. Our deſtination was for the city of Euphemia in Calabria, but unfavourable weather obliged us to remain at Pelorus three days. Wearied at length with delay, we determined to proceed on our voyage, and although the ſea ſeemed unuſually agitated, yet it did not deter us from embarking. As we approached the gulf of Charybdis, the waters ſeemed whirled round with ſuch violence, as to form a large hollow in the centre of the vortex. Turning my eyes to Mount Ætna, I ſaw it throw out huge volumes of ſmoke, which entirely covered the iſland. This awful appearance, with the dreadful noiſe, and the ſulphureous ſmell which accompanied it, filled me with ſtrong apprehenſions that ſome terrible calamity was approaching. The ſea itſelf exhibited a very unuſual appearance, its agitation reſembling that of the waters of a lake which is covered with bubbles in a violent ſhower of rain. My ſurpriſe was ſtill increaſed by the calmneſs and ſerenity of the weather; not a breeze ſtirred, not a cloud obſcured the face of the ſky, which might be ſuppoſed to produce theſe dreadful commotions. I therefore warned my companions, that the unuſual phenomena which we obſerved, were the forerunners of an earthquake. Soon after we ſtood in for the ſhore, and landed at Tropæa; but we had ſcarcely arrived at the Jeſuits college in that city, when a horrid ſound, which reſembled the rattling wheels of an infinite number of chariots, driven furiouſly along, ſtunned our ears. Soon after a terrible ſhaking of the earth began; the ground on which we ſtood ſeemed to vibrate, as if we were in the ſcale of a balance, which continued waving. The motion ſoon grew more violent; I could no longer keep my legs, but was thrown proſtrate upon the ground. After ſome time had elapſed, when I had recovered from the conſternation; and finding that I was unhurt amidſt the general craſh, I reſolved to make the beſt of my way to a place of ſafety, and running as faſt as I could, I reached the ſhore. I ſoon found the boat in which I had landed, as well as my companions; and leaving this ſcene of deſolation, we proſecuted our voyage along the coaſt. Next day we arrived at Rochetta, where we landed, although the earth ſtill continued in violent commotion. But we had ſcarcely reached the inn when we were again obliged to return to the boat. In about half an hour we ſaw the greateſt part of the town, as well as the inn where we had ſtopped, levelled with the ground, and moſt of the inhabitants buried in its ruins. As we proceeded onward, we landed at Lopezium, which is a caſtle about half way between Tropæa and Euphemia, to which we were bound; and, here, wherever I looked, nothing but ſcenes of ruin and horror preſented themſelves. Towns and caſtles were levelled with the ground, and Stromboli at the diſtance of 60 miles threw out an immenſe body of flames, accompanied with a noiſe which could be diſtinctly heard. But our attention was quickly drawn from more remote to preſent danger. The rattling ſound which immediately precedes an earthquake, again alarmed us; every moment it ſeemed to grow louder and louder, and to approach nearer the place on which we ſtood. A dreadful ſhaking of the earth now began, ſo that being unable to ſtand, my companions and I caught hold of whatever ſhrub was next to us, to ſupport ourſelves. After ſome time the violent commotion ceaſed, and we ſtood up, and propoſed to proſecute our voyage to Euphemia, which lay within ſight; but in the meantime, while we were preparing ourſelves, I turned my eyes towards the city, but could ſee nothing but a thick, black cloud, which ſeemed to reſt on the place. This appeared an extraordinary circumſtance, as the ſky all round was calm and ſerene. We waited till the cloud paſſed away, and then turning to look for the city, it was totally ſunk, and where it formerly ſtood, nothing remained but a diſmal and putrid lake."

202 In Sicily in 1693.

In the year 1693, an earthquake happened in Sicily, which not only ſhook the whole iſland, but alſo reached to Naples and Malta. Previous to the ſhock, a black cloud was ſeen hovering over the city of Catania, which was deſtroyed at this time. The ſea began to be violently agitated; the ſhocks ſucceeded like the diſcharge of a great number of artillery; the motion of the earth was ſo violent, that no perſons could keep their legs. Even thoſe who lay on the ground were toſſed from ſide to ſide, as on a rolling billow; high walls were razed from their foundations, and were thrown to the diſtance of ſeveral paces. Almoſt every building in the countries which it viſited was thrown down; 54 cities and towns, beſides a great number of villages, were either greatly damaged, or totally deſtroyed. Among thoſe which we have already mentioned, was the city of Catania, one of the moſt ancient and flouriſhing in the kingdom. After the thick cloud which remained after the earthquake had diſſipated, no remains of this magnificent city could be ſeen. Of 18,900 inhabitants, not fewer than 18,000 periſhed by this dreadful calamity.

203 In Jamaica in 1692.

The terrible earthquake which viſited the iſland of Jamaica in 1692, affords us another example of almoſt the whole of the phenomena which were enumerated

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as the forerunners or attendants of earthquakes. It was on the 7th of June, in that year, that this dreadful calamity, which in two minutes totally deſtroyed the town of Port Royal, on the ſouth ſide of Jamaica, and at that time the capital of the iſland, took place. The effect of the ſhock on the ſurface was immediately preceded by a hollow rattling noiſe, like that of thunder. The ſtreets were heaved up like waves of the ſea, and then inſtantly thrown down into deep pits. All the wells diſcharged their waters with prodigious agitation; the ſea burſt its bounds, and deluged a ſmall part of the town which was not entirely overwhelmed. The fiſſures produced in the earth were ſo great, that one of the ſtreets ſeemed twice as broad as formerly, and in ſome places the earth opened and cloſed again for ſome time. A great many of theſe openings were ſeen at once. In ſome of them, the houſes and inhabitants, and every thing that was near, were ſwallowed up. Some perſons were ſwallowed up in one of theſe chaſms, and what will appear moſt extraordinary, and indeed almoſt incredible, were thrown out alive from another. Whole ſtreets ſunk in ſome, and from others an immenſe body of water was projected high into the air. Smells which were extremely offenſive now ſucceeded; nothing but the diſtant noiſe of falling mountains was heard, and the ſky, which before the ſhock was ſtill and ſerene, aſſumed a dull red colour.

The effects of this earthquake were not limited to this ſpot. It was ſeverely felt through the whole iſland, which in many places ſuſtained very material damage. Indeed there were few houſes which were not either injured or thrown down. In ſome places the inhabitants, houſes, trees, and whole ſurface, were ſwallowed up in the ſame chaſm; and what was formerly dry land was left a pool of water. The wells in almoſt every corner of the iſland, whatever was their depth, threw out their water with great violence. The rivers were either entirely ſtopped, or ceaſed to flow for 24 hours; and many of them formed to themſelves new channels. At the diſtance of 12 miles from the ſea, an immenſe body of water ſpouted out from a gap which was formed in the earth, and was projected to a great height in the air. Such was the violence of the ſhock, that many perſons were thrown down on their faces, even in places where the ſurface of the ground remained unbroken. It was obſerved that the ſhock was moſt ſeverely felt in the immediate vicinity of the mountains. Could this ariſe from the greater preſſure, and conſequently the greater reſiſtance, or was it becauſe the force which produced theſe terrible effects exiſted near them?

After the great ſhock which deſtroyed the town of Port Royal, the inhabitants who eſcaped went on board ſhips in the harbour, where many of them remained for two months, during which time the ſhocks were repeated, and were ſo frequent, that there were ſometimes two or three in the courſe of an hour. Theſe were ſtill accompanied with the ſame rattling noiſe, like that of thunder, or like the ruſhing noiſe occaſioned by a current of air in rapid motion. They were alſo attended with what are called *brimſtone blaſts*. Theſe, it is probable, were ſulphureous vapours which iſſued from the openings made by the earthquake. The atmoſphere, however, ſeemed to be loaded with noiſome vapours, for a very general ſickneſs ſoon ſucceeded, which in a ſhort time ſwept off not fewer than 3000 perſons.

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But of all the earthquakes, the hiſtory of which is on record, that which happened at Liſbon, in the year 1755, was by far the moſt extenſive in its effects, and, from its recent occurrence, will probably be deemed the moſt intereſting. In the year 1750, ſeveral ſhocks of earthquakes had been ſenſibly felt. The four following years were remarkable for exceſſive drought. The ſprings which formerly yielded abundance of water, were totally dried up and loſt; the winds which chiefly prevailed were from the north and north-eaſt. During this period alſo there were ſlight tremors of the earth; the ſeaſons in 1755, were unuſually wet, and the ſummer, as the conſequence of this, proved unuſually cold. But for the ſpace of 40 days before the earthquake happened, the ſky was more clear and ſerene. On the laſt day of October the face of the ſun was conſiderably obſcured, and a general gloom prevailed over the atmoſphere. The day following (the 1ſt of November) a thick fog aroſe, but it was ſoon diſſipated by the heat of the ſun. Not a breath of wind was ſtirring; the ſea was perfectly calm, and the heat of the weather was equal to that of June or July in this country. At 35 minutes after nine in the morning, without any previous warning, excepting the rattling noiſe reſembling that of diſtant thunder, the earthquake came on with ſhort, quick vibrations, and ſhook the very foundation of the city, ſo that many of the houſes inſtantly fell. A pauſe, which was indeed juſt perceptible, ſucceeded, and the motion changed. The houſes were then toſſed from ſide to ſide, like the motion of a waggon driven violently over rugged ſtones. It was this ſecond ſhock which laid great part of the city in ruin, and, as might be expected, great numbers of the inhabitants were deſtroyed at the ſame time. The whole duration of the earthquake did not exceed ſix minutes. When it began, ſome perſons in a boat, at the diſtance of a mile from the city, and in deep water, thought the boat had ſtruck on a rock, in conſequence of the motion which was communicated to it. At the ſame time they perceived the houſes falling on both ſides of the river. The bed of the Tagus was in many places raiſed to the very ſurface of the water; ſhips were driven from their anchors or moorings, and were toſſed about with great violence; and the perſons on board did not for ſome time know whether they were afloat or aground. A large new pier with ſeveral hundreds of people upon it, ſunk to an unfathomable depth, and not one of the dead bodies was ever found. The bar of the river was at one time ſeen dry from ſide to ſide; but ſuddenly the ſea came rolling in like a mountain, and in one part of the river the water roſe in an inſtant to the extraordinary height of 50 feet. At noon another ſhock happened; the walls of ſome houſes that remained were ſeen to open from top to bottom, near a foot wide, and were afterwards ſo exactly cloſed, that ſcarcely any mark of this injury remained.

204 At Liſbon in 1755.

205 The ſhock of this earthquake felt at Colares;

But what was the moſt ſingular circumſtance attending this earthquake was, the prodigious extent to which its effects reached. At Colares, 20 miles from Liſbon, and two miles from the ſea, the weather was uncommonly warm for the ſeaſon, on the laſt day of October. About four o'clock in the afternoon, a fog aroſe which, proceeding

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proceeding from the ſea, covered the valleys. This was an unuſual occurrence at that ſeaſon of the year; but ſoon after the wind ſhifting, the fog returned to the ſea, collected over its ſurface, and became very thick and dark; and as the fog diſperſed, the ſea was violently agitated, and with great noiſe. On the firſt of November, at the dawn of day, the ſky was fair and ſerene; about nine o'clock the ſun was overclouded, and became dim. Half an hour after, the rattling noiſe like that of chariots was heard; and this ſoon increaſed to ſuch a degree, that it reſembled the exploſions of the largeſt artillery. The ſhock of an earthquake was immediately felt, and was quickly ſucceeded by a ſecond and a third. In theſe ſhocks it was obſerved, that the walls of buildings moved from eaſt to weſt. From ſome of the mountains flames were ſeen iſſuing, ſomewhat reſembling the kindling of charcoal accompanied with a great deal of thick black ſmoke. The ſmoke which aroſe from one mountain was at the ſame time accompanied with noiſe, which increaſed with the quantity of ſmoke. When the place from which the ſmoke iſſued was afterwards examined, no ſigns of fire could be perceived.

206 At Oporto. At Oporto, near the mouth of the river Douro, the earthquake began at 40 minutes paſt nine. The ſky was quite ſerene when the hollow rattling noiſe was heard, and it was immediately attended with a commotion of the earth. In the ſpace of a minute or two, the river roſe and fell five or ſix feet, and continued this motion for four hours. In ſome places it ſeemed to open, and diſcharge great quantities of air. The ſea was alſo violently agitated, and indeed the agitation was ſo great, to the diſtance of a league beyond the bar, that it was ſuppoſed the diſcharge of air from that place muſt alſo have been very conſiderable.

207 Deſtroys St Ubes. St Ubes, a ſea-port town twenty miles ſouth of Liſbon, was entirely ſwallowed up by the repeated ſhocks of this earthquake, and the immenſe ſurf of the ſea which was produced. Large maſſes of rock were detached from the promontory at the extremity of the town. This promontory conſiſts of a chain of mountains compoſed of a very hard ſtone.

208 Felt in Spain. The ſame earthquake was felt in almoſt every part of Spain. The only places which eſcaped from its effects were the provinces of Arragon, Catalonia, and Valencia. At Ayamonte, which is near the place where the Guadiana falls into the bay of Cadiz, the earthquake was not felt till a little before ten o'clock. It was here alſo preceded by the hollow rattling noiſe. The ſhocks continued with intervals, for 14 or 15 minutes, and did very conſiderable damage. Scarcely half an hour had elapſed from the time that the commotion firſt began, when the ſea, the river, and canals, roſe violently over their banks, and laid every place near them under water. The ſea rolled in in huge mountains, and carried every thing before it.

The earthquake began at Cadiz ſome minutes after nine in the morning, and laſted about five minutes. The water in the ciſterns under ground was ſo much agitated, that it roſe in the form of froth. About ten minutes after eleven, a huge wave was ſeen coming from the ſea, at the diſtance of eight miles, which was ſuppoſed not to be leſs than 60 feet high, and burſt in upon the city. The water returned with the ſame violence with which it approached, and places which were deep at low water were left quite dry. Similar waves continued, but gradually leſſening till the evening.

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The earthquake was not felt at Gibraltar till after ten o'clock. There it began with a tremulous motion of the earth, which continued for about half a minute. A violent ſhock then followed; the tremulous motion again commenced, and continued for five or ſix ſeconds, and then ſucceeded a ſecond ſhock, but leſs violent than the firſt. The whole time did not exceed two minutes; the earth had an undulating motion; ſome of the guns on the batteries were ſeen to riſe, and others to ſink. Many people, ſeized with ſickneſs and giddineſs, fell down. Some who were walking or riding, felt no ſhock, but were attacked with ſickneſs. The ſea had an extraordinary flux and reflux; it ebbed and flowed every 15 minutes; it roſe ſix feet, and then fell ſuddenly ſo low, that a great many fiſh and ſmall boats were left on the ſhore.

The ſhock was felt at Madrid nearly at the ſame time as at Gibraltar. It continued for ſix minutes, and the ſame ſickneſs and giddineſs prevailed. It was not felt by thoſe who walked ſmartly, or who were in carriages, and no accident happened excepting two perſons who were killed by the fall of a ſtone eroſs from the porch of a church.

Malaga, a ſea-port town on the Mediterranean, experienced a violent ſhock; the bells were ſet a ringing in the ſteeples, and the water of the wells overflowed, and as ſuddenly retired. St Lucar, at the mouth of the Guadalquiver, ſuffered much from a ſimilar ſhock, as well as from an inundation of the ſea, which broke in, and did great damage. At Seville, 16 leagues above this, a number of houſes was thrown down; the celebrated tower of the cathedral, called *La Giralda*, opened in the four ſides; the waters were thrown into violent agitation, and the veſſels in the river were driven on ſhore.

209 In Africa. In Africa this earthquake was felt nearly as ſeverely as in Europe. Great part of the city of Algiers was deſtroyed. This happened about ten in the morning. About the ſame time at Arzilla, a town in the kingdom of Fez, the ſea ſuddenly roſe with ſuch impetuoſity, that it lifted up a veſſel in the bay, and forced it on ſhore with ſuch violence that it was broken to pieces. A boat was alſo found within land, at the diſtance of two muſket ſhots from the ſea. At Fez and Mequinez, many houſes were thrown down, and numbers of perſons were buried in the ruins.

Many people were deſtroyed at Morocco by the falling of houſes. Eight leagues from the city the earth opened, and ſwallowed up a village with all its inhabitants, to the number of 8,000 or 10,000, as well as all their cattle. Soon after the earth cloſed, and they were ſeen no more. The town of Sallee alſo ſuffered greatly; a third part of the houſes were thrown down; the waters ruſhed into the ſtreets with great violence, and when they retired, they left behind them a large quantity of fiſh. The earthquake began at Tangier at ten in the morning; its whole duration was about ten or twelve minutes. The ſea came up to the walls with great violence, and retired immediately with the ſame rapidity, leaving behind a great quantity of fiſh. This agitation of the water was repeated no leſs than 18 times, and continued till about ſix o'clock in the evening. It began at the ſame time at Tetuan, but its duration

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ration was only about ſeven or eight minutes. Three of the ſhocks were ſo violent as to excite great apprehenſions that the city would be deſtroyed. Similar effects were produced by the ſame earthquake at different places along the African ſhore of the Mediterranean.

210 In Madeira and the Weſt Indies

At the town of Funchal in Madeira, the firſt ſhock of this earthquake was felt at 38 minutes paſt nine. It was preceded by the rattling noiſe, which ſeemed to be produced in the air; the ſhock, it was ſuppoſed, continued for more than a minute; the earth moved with a vibratory, undulating motion, and ſome of the vibrations increaſed greatly in force. The noiſe in the air which accompanied the ſhocks, laſted ſome ſeconds after the motion of the earth had ceaſed. At three quarters paſt eleven, the day being calm and ſerene, the ſea retired ſuddenly, then, without the leaſt noiſe, roſe with a great ſwell, overflowed the ſhore, and entered the city. It roſe 15 feet perpendicular above high-water mark. Having thus fluctuated four or five times, it at laſt ſubſided, and reſumed its former ſtillneſs. In the northern part of the iſland, the inundation was ſtill more violent. It firſt retired to the diſtance of 100 paces, and ſuddenly returning, overflowed the ſhore, broke down walls of magazines and ſtorehouſes, and left behind it great quantities of fiſh in the ſtreets of a village. At this place the ſea roſe only once beyond the high-water mark, although it continued to fluctuate much longer before it entirely ſubſided than at Funchal.

Such were the effects of this earthquake, in thoſe places where it was accompanied with conſiderable damage. It was, however, perceptibly felt to a great diſtance in every direction, either by a ſlight motion of the earth, or by the agitation of the waters. At the iſland of Antigua the ſea roſe to ſuch a height as had never been before known, and afterwards the water at the wharfs which uſed to be ſix feet deep, was not more than two inches. About two in the afternoon, the ſea ebbed and flowed at Barbadoes in a very unuſual manner. It overflowed the wharfs, and ruſhed into the ſtreets. This flux and reflux continued till 10 at night.

211 In France.

Shocks were diſtinctly felt in different parts of France, as at Bayonne, Bourdeaux, and Lyons. The waters were alſo obſerved to be agitated in different places, as at Angouleme, and Havre de Grace, but with a leſs degree of violence than ſome which have been mentioned. At Angouleme, a ſubterraneous noiſe like thunder was heard, and ſoon after a torrent of water, mixed with red ſand, was diſcharged from an opening in the earth. Moſt of the ſprings in the neighbourhood ſunk, and continued dry for ſome time.

212 In Germany.

The effects of this earthquake were alſo very perceptible in many places of Germany. Throughout the duchy of Holſtein, the waters were greatly agitated, particularly the Elbe and Trave. The water of a lake, called *Libſee*, in Brandenburg, ebbed and flowed ſix times in half an hour, and although the weather was then perfectly calm, this motion was accompanied with a great noiſe. A ſimilar agitation took place in the waters of the lakes called *Mupelgaſt* and *Netzo*, but here there was alſo emitted a moſt offenſive ſmell.

The ſea was greatly agitated round the iſland of Corſica, and many of the rivers of the iſland overflowed their banks. The ſame earthquake was felt in the city of Milan in Italy, and its neighbourhood. Turin in Savoy experienced a very ſmart ſhock.

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Many of the rivers of Switzerland became all at once muddy, although there had been no rain. The lake of Neufchatel roſe to the height of two feet above its uſual level, and continued at this height for a few hours. The waters of the lake of Zurich were alſo greatly agitated.

213 In Switzerland.

214 In Holland.

The commotion of the waters in Holland was ſtill more remarkable. In the afternoon of the 1ſt of November, the waters of the Rhine at Alphen, between Leyden and Woerden, were ſo violently agitated, that the buoys were broken from their chains, large veſſels parted from their cables, and ſmaller ones were thrown upon the dry land. At 11 in the forenoon at Amſterdam, when the air was perfectly calm, the waters in the canals were thrown into great commotion, ſo that boats broke looſe from their moorings, chandeliers were obſerved to vibrate in the churches, although it is ſaid no motion of the earth was perceptible. In the forenoon, at Haarlem, not only the water in the rivers, canals, &c. but, it is aſſerted, ſmaller quantities of fluids contained in veſſels, were greatly agitated, and ſometimes daſhed over the ſides of the veſſels. This continued for about four minutes. Between 10 and 11 in the forenoon, in ſome of the canals at Leyden, the waters roſe ſuddenly, and produced very perceptible undulations.

215 In Norway, &c.

The effects of this earthquake extended as far north as Norway and Sweden: many of the rivers and lakes in Norway were greatly agitated; ſhocks were felt in ſeveral of the provinces in Sweden, and commotions of the waters, with the rivers and lakes, eſpecially in Dalecarlia, were obſerved. The river Dala ſuddenly overflowed its banks, and as ſuddenly retired; and at the ſame time, a lake which is a league diſtant from it, bubbled up with great violence. Several ſmart ſhocks were felt at Fahlun, a town in Dalecarlia.

216 In Britain.

In many places of Great Britain and Ireland, the agitation of the waters was very perceptible. At Eaton bridge in Kent, near a pond of an acre in extent, ſome perſons heard a ſudden noiſe, which they ſuppoſed was occaſioned by ſomething falling into the pond, for it was then a dead calm, and ran to the ſpot, where they ſaw the pond open in the middle, while the water daſhed over a perpendicular bank two feet high. This motion was repeated ſeveral times, and ſtill accompanied with a great noiſe.

At Cobham in Surry, between 10 and 11 o'clock A. M. a perſon was watering a horſe at a pond, the waters of which were derived from ſprings. At the moment the animal was drinking, the waters retired from his mouth, and left the bottom of the pond dry. It then returned with great violence, and when it retired, its progreſs was towards the ſouth. About the ſame time at Buſhbridge, in the ſame county, while the weather was remarkably calm, the waters of a canal 700 feet long and 58 broad, were greatly agitated, and this was accompanied with an unuſual noiſe. The waters roſe between two and three feet above the uſual level, in the form of a heap or ridge, extending 30 yards in length. This ridge then heeled towards the north ſide, and flowed with great impetuoſity over the graſs walk; it then returned to the canal, again heaped up in the middle, and then heeled to the ſouth ſide with

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with ſtill greater violence, flowing over the graſs walk, and leaving ſeveral feet at the bottom of the canal on the north ſide perfectly dry. Theſe motions continued for 15 minutes, after which the waters reſumed their former tranquillity. During the agitation of the waters, the ſand and mud at the bottom were thrown up, and mixed with them.

In Suffolk, the water of a pond at Dunſtal roſe gradually for ſeveral minutes in the form of a pyramid, and then fell down like a water-ſpout. In other ponds in the ſame neighbourhood, the waters of which were leſs agitated, there was a ſmooth flux and reflux from the one extremity to the other.

At Earſycourt in Berkſhire, about 11 o'clock, a perſon ſtanding near a fiſh pond, felt a violent trembling of the earth, which continued for about a minute. He obſerved immediately after, the water move from the ſouth to the north end of the pond, leaving the bottom of the ſouth end quite dry, to the extent of ſix feet. It then returned, flowed at the ſouth end, roſe three feet up the bank, and immediately after returned to the north bank, where it roſe to the ſame height. Between the flux and reflux the waters formed a ridge in the middle of the pond, 20 inches higher than the level on each ſide, and boiled up with great violence.

Similar phenomena were obſerved about half after ten, near Durham. A perſon was alarmed with a ſudden ruſhing noiſe, which ſeemed to proceed from a pond. The water roſe gradually up without any fluctuating motion, ſtood ſome inches higher than the uſual level; it then ſubſided and ſwelled again, and continued in this manner riſing and falling for the ſpace of ſix or ſeven minutes, riſing four or five times in a minute.

The effects of this earthquake in Derbyſhire excited conſiderable alarm. At Barlborough, between 11 and 12 o'clock, in a boat-houſe on the weſt ſide of a large body of water, called *Pibley dam*, which is ſuppoſed to cover not leſs than 30 acres of land, there was heard a ſudden and terrible noiſe; a ſwell of water proceeding from the ſouth, roſe two feet on the ſlope dam head at the north end. It then ſubſided, but immediately returned. The water continued thus agitated for 45 minutes, but became gradually leſs violent. At Eyam bridge in the Peak, an overſeer of the lead mines, ſitting in his room about 11 o'clock, felt a ſudden ſhock, by which the chair on which he ſat was ſuddenly raiſed, and ſome pieces of plaſter were broken off from the ſides of the room. The commotion was ſo great that he thought the engine ſhaft had fallen together, and he ran out to ſee what was the matter, and found every thing in ſafety. Some miners employed at the time in a drift 120 yards deep, were greatly alarmed firſt with one ſhock, and then with a ſecond, which ſeemed to be ſo violent as to make the rocks grind upon one another. Three other ſhocks ſucceeded the two firſt at intervals of a few minutes, and became gradually weaker.

A little after 10 o'clock in the morning, the water in a moat which ſurrounds Shireburn caſtle in Oxfordſhire, exhibited a very unuſual appearance. A thick fog prevailed, the air was perfectly ſtill, and the ſurface of the water quite ſmooth. At one corner it was obſerved to flow towards the ſhore, and then again to retire; and this flux and reflux continued for ſome time quite regular. Every flux began ſlowly; but increaſed in its velocity till near its full height, when it ruſhed with great impetuoſity; and having remained for a ſhort time ſtationary, it then retired, at firſt ſlowly, but at laſt it ſunk with great rapidity. What will appear moſt ſingular in this commotion of the water is, that it was limited to one part of the moat. At a different corner about 25 yards diſtant no motion could be perceived. But in that part of the moat directly oppoſite to the place where the motion of the water was firſt obſerved, the water roſe towards the ſhore at the ſame time as at the other ſide. In a pond at a little diſtance the waters were agitated in a ſimilar manner, but the riſings and ſinkings took place at different times from thoſe in the moat.

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On the evening of the ſame day, about three quarters after ſix, and about the time of two hours ebb of the tide, at White rock in Glamorganſhire, a great body of water ruſhed up accompanied with great noiſe. It was in ſuch quantity that it floated two veſſels not leſs than 200 tons burden each, drove them from their moorings, and carried them acroſs the river. The whole length of time of the riſe and fall of this body of water did not exceed 10 minutes, ſo that it ſeemed to have burſt from the earth at the ſpot where it appeared. It ſeems ſingular, if the account of it be correct, that on this ſpot the effects of the earthquake ſhould be felt at the diſtance of ſeven or eight hours from the time it was felt in other parts of the iſland.

217 In Scotland.

The waters of the lakes in Scotland were alſo greatly agitated from the ſame cauſe. Half an hour after nine in the morning, without the leaſt breath of wind, the water in Loch Lomond roſe ſuddenly and violently againſt its banks. It immediately fell very low, again returned to the ſhore, and in five minutes roſe as high as at firſt. This commotion continued till 15 minutes after 10, with an alternate flux and reflux every five minutes. From this time, till 11 o'clock, the height to which the water roſe gradually diminiſhed, till it reſumed its former tranquillity. But each flux and reflux continued for a period of five minutes as at firſt. Here the violence of the ſhock was ſuch, that a large ſtone lying at ſome diſtanee from the ſhore in ſhallow water, was moved from its place and carried to dry land, leaving a deep furrow in the ground along which it had moved.

About the ſame time the waters of Loch Neſs in the north of Scotland exhibited alſo a very unuſual agitation. About ten o'clock the river Oich, which falls into the head of the loch, ſwelled very much, and ran upwards from the loch with a high wave two or three feet above its uſual level. The motion of the wave was in a direction contrary to that of the wind, and it proceeded with great rapidity up the river for the ſpace of 200 yards, broke on a ſhallow, and overflowed the banks. It then returned gently to the loch. This ebbing and flowing continued for about an hour, the height of the waves gradually diminiſhing, till, about 11 o'clock, a wave higher than any of the former broke with ſuch violence on the bank on the ſide of the river, that it ran upwards of 30 feet from the bank.

218 In Ireland.

Between two and three o'clock in the afternoon, at Kinſale in Ireland, when the weather was perfectly calm and the tide nearly full, a great body of water ſuddenly burſt into the harbour, and with ſuch violence,

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lence, that it broke the cables of two veſſels, each moored with two anchors, and of ſeveral boats which lay near the town. The veſſels were whirled round ſeveral times by an eddy formed in the water, and then hurried back again with the ſame rapidity as before. Theſe motions were repeated different times; and while the current ruſhed up along one ſide of the harbour, it ran down with the ſame violence along the other. The muddy bottom of the harbour was greatly altered; the mud was removed from ſome places and depoſited in others. At one place the height of the water, where it was meaſured, was found to be five feet and a half; in other places it is ſaid to have been much higher, particularly where it flowed into the market-place with ſuch rapidity, that many perſons had not time to eſcape, but were immerſed, knee deep, in the water. Theſe commotions extended ſeveral miles up the river, and were moſt perceptible in ſhallow places. The alternate elevation and depreſſion of the water continued about ten minutes, when the tide returned to its uſual level. In the evening, between ſix and ſeven, the water roſe again, but with leſs violence than before, and continued to ebb and flow till three next morning. The riſe of the waters was not at firſt gradual, but, accompanied with a hollow noiſe, roſe ſix or ſeven feet in a minute, and ruſhed in like a deluge, after which it as ſuddenly ſubſided. The waters, too, became thick and muddy, emitting at the ſame time a moſt offenſive ſmell. Similar agitations of the waters were obſerved all along the coaſt to the weſtward of Kinſale.

219 Effects at ſea.

Such were the phenomena of this earthquake, as they were obſerved on land in the different places which have been mentioned. Its effects were alſo ſeverely felt at ſea. A frigate off St Lucar received ſo violent a ſhock, that it was ſuppoſed ſhe had ſtruck the ground. Another veſſel in N. Lat. 36.-24. between nine and ten in the morning, was ſo much ſhaken and ſtrained as if ſhe had ſtruck upon a rock. The ſeam of the deck opened, and the compaſs was overturned. The ſenſation experienced by ſome perſons on board of another veſſel, which was then in N. Lat. 25°. W. Long. 40°. were ſuch as if ſhe had been ſuddenly raiſed up and ſuſpended by a rope. One perſon looking out at the cabin window, thought he ſaw land about a mile diſtant; but when he reached the deck, no land was to be ſeen. A ſtrong current was obſerved croſſing the ſhip's way to leeward. The current returned in about a minute with great violence; and, at the diſtance of about a league, three craggy pointed rocks were ſeen throwing up water of various colours, and ſeemingly reſembling fire. This appearance terminated in a thick black cloud, which aroſe heavily in the atmoſphere. Between nine and ten in the morning another ſhip, 40 leagues off St Vincent, received ſo violent a ſhock, that the men on deck were thrown a foot and a half above its ſurface, and the anchors, although they were laſhed down, bounced up. Immediately after the ſhip ſunk in the water ſo low as the main chains. On heaving the lead a great depth of water was found, and the line was of a yellow colour, and gave out the ſmell of ſulphur. The firſt ſhock was the moſt violent; but ſmaller ones were repeated for 24 hours.

220 On ſprings.

The effects of this earthquake on ſprings were very remarkable. On the afternoon of the 31ſt of October, the water of a fountain at Colares was obſerved to be greatly diminiſhed. On the morning of the 1ſt of November, the day on which the earthquake happened, it became thick and muddy, but afterwards recovered its uſual quantity and limpidity. In ſome places ſprings appeared where there had been formerly no water, and continued afterwards to flow. At Varge, on the river Macaas, many ſprings of water burſt forth at the time of the earthquake, and ſome threw up their waters mixed with ſand of various colours, to the height of 18 or 20 feet. In Barbary, a ſtream of water, which was as red as blood, burſt forth from a mountain, which was ſplit in two. At Tangier all the fountains were dried up during the whole of the day on which the earthquake happened. The mineral waters of Toplitz, a village in Bohemia, which have been celebrated ſince the year 1762, experienced a very remarkable change. The principal hot ſpring had continued to flow from the time it was diſcovered, of the ſame temperature and the ſame in quantity. On the morning of the earthquake, between 11 and 12 o'clock, the waters of this ſpring increaſed ſo much in quantity, that all the baths ran over in the ſpace of half an hour. A ſhort time before the water increaſed, it flowed from the ſpring thick and muddy; and then having entirely ſtopped for about a minute, it burſt out with great violence, carrying before it a great quantity of reddiſh ochre. It afterwards became limpid, and flowed as formerly; but in larger quantity, and of a higher temperature. At Angouleme in France the earth opened in one place, and diſcharged a great body of water, which was mixed with reddiſh ſand. Moſt of the ſprings in the neighbourhood ſunk ſo low, that for ſome time it was ſuppoſed they had become quite dry.

Such were the extraordinary effects of this terrible earthquake, which extended over a ſpace not leſs than four millions of ſquare miles. Other earthquakes, although of more limited extent, have produced effects not leſs deſtructive, and particularly ſome of the earthquakes which have viſited Italy and Sicily in modern times; accounts of which have been drawn up with accuracy and attention. Some of theſe we ſhall now detail.

221 Earthquake in Calabria in 1783.

One of the moſt calamitous earthquakes was that which befel Calabria in the year 1783. Of this earthquake Sir William Hamilton, who, ſoon after the earthquake happened, viſited the ſcenes of deſolation which it left behind, has drawn up a particular account. He obſerves, that "if on a map of Italy, and with your compaſs on the ſcale of Italian miles, you were to meaſure off 22, and then fixing the central point on the city of Oppido, which ſeemed to be the ſpot where the earthquake had exerted its greateſt force, form a circle, the radius of which will be 22 miles, you will then include all the towns, villages, &c. that have been utterly ruined, and the ſpots where the greateſt mortality happened, and where there have been the moſt viſible alterations on the face of the earth. Then extend your compaſs in the ſame ſcale to 72 miles, preſerving the ſame centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly obſerved in the damage done to the

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the buildings, as alſo in the degree of mortality, in proportion as the countries were more or leſs diſtant from this ſuppoſed centre of the evil."

This earthquake, it has been remarked, differed very conſiderably from others in one circumſtance, which was this. Where it happened that two towns were ſituated at the ſame diſtance from the centre, one of which was placed on a hill, and the other on a plain, it was found that the town on the loweſt ſituation always ſuſtained the greateſt damage from the ſhocks of the earthquakes which are alluded to above.

That part of Calabria which moſt ſeverely felt this dreadful calamity, lies between the 38th and 39th degrees of latitude, and the force of the earthquake extended from the foot of the Appenines called Monte Dijo, Monte Sacro, and Monte Caulene, as far to the weſtward as the Tyrrhene ſea. By the ſhock of the 5th of February, every town, village, and farm-houſe neareſt to the mountains, whether ſituated on ſome part of the elevated ground or on the plain, was left a heap of ruins. In proportion to the diſtance from the centre, as has been already hinted, the damage ſuſtained was more or leſs conſiderable. But even the more diſtant towns and villages ſuffered greatly from the ſhocks which happened on the 7th, 26th, and 28th of February, and on the 1ſt of March. From the time the firſt ſhock came on, the earth continued in a conſtant tremor; the ſhocks were felt with different degrees of force in different parts of the provinces which were the ſcene of this terrible calamity; and the motion was either in a whirling direction, as in a vortex, or horizontal, or pulſatory, the beatings proceeding from the bottom upwards. The apprehenſions and alarms of the miſerable inhabitants were terribly increaſed by this variety of changing motions, dreading that every moment the earth would open under their feet and ſwallow them up. That part of Calabria which ſuffered from this earthquake, was alſo drenched with long continued and heavy rains, accompanied with frequent and furious ſqualls of wind. Theſe rains prevailed particularly on the weſtern ſide, where many fiſſures had appeared in the mountains. Some mountains had been lowered greatly, and others had been entirely ſwallowed up. The roads were rendered impaſſable by the deep chaſms which were left by the ſhock; valleys were filled up by the parts of mountains which were ſplit aſunder; the courſe of rivers was changed; ſprings were dried up, and new ſprings burſt out where none exiſted before.

At Laureana in Farther Calabria, two houſes, ſurrounded with extenſive plantations of olive and mulberry trees, ſituated in a valley, were removed by the force of the earthquake, with all their trees, and carried to the diſtance of a mile; and on the ſpot where they formerly ſtood, hot water burſt from the earth, and was projected to a conſiderable height into the air. The water was mixed with ſand of a reddiſh colour. Some countrymen and ſhepherds, who were employed in rural affairs near this ſpot, were ſwallowed up, with their teams of oxen, and their whole flocks of goats and ſheep. The number of inhabitants who loſt their lives in this calamity, exceeded, according to ſome calculations, 32,000; but it is ſuppoſed by others, that, including ſtrangers, the number was not leſs than 40,000.

The inhabitants of the town of Scilla, on the firſt ſhock of the earthquake on the 5th of February, had fled along with their prince to the ſea ſhore for ſafety, and remained either on the ſtrand or in boats near the ſhore. In the night time a tremendous wave overflowed the land to the diſtance of three miles from the ſhore, and, in its return, ſwept off near 3000 of the inhabitants, among whom was the prince. This water was ſaid by ſome to have been boiling hot, ſo that many of the people were ſuppoſed to have been ſcalded with it. A mountain, it is aſſerted, of 500 palms in height, and 1300 palms in circumference at its baſe, was detached from the place where it ſtood, and carried to the diſtance of four miles. It was about the ſame time that the hill on which the town of Oppido ſtood, and which extended three miles in length, was ſplit in two, and filled up on each ſide the bed of a river. Two great lakes were formed by the current of the rivers being ſtopped; and, as they increaſed in extent, infected the air with their putrid and noiſome exhalations.

Sir William Hamilton, who was then reſident at Naples as ambaſſador from Britain, was indefatigable in obtaining every kind of information with regard to the effects of this earthquake. With this view he made an extenſive tour over theſe parts of the country which had been viſited by this calamity. Some of the accounts which were firſt publiſhed ſeem to have been ſomewhat exaggerated, either from the love of the marvellous in thoſe who framed them, or from the exceſſive alarms of the ſurviving ſufferers. On the 2d of May following Sir William landed on the coaſt of Hither Calabria. The effects of the earthquake were firſt perceived at Cedraro. The inhabitants had quitted their houſes, but it did not appear that the town had ſuſtained any material damage. Moſt of the inhabitants of St Lucido were then living in barracks, and the baron's palace, as well as the church ſteeple, had ſuffered greatly. He afterwards landed at the town of Pizzo in Farther Calabria. This town ſtood on volcanic tufa. It ſuſtained great injury from the ſhock of the 5th February, but was completely deſtroyed by that of the 28th. Here he was informed, that Stromboli, a volcanic mountain which is nearly oppoſite, and in full view, but 50 miles diſtant, had ejected much leſs matter, and had thrown up leſs ſmoke, during the time of the earthquakes, than it had done for many years before. Even at this time ſlight ſhocks of earthquakes were occaſionally felt. One indeed happened the ſame night. The boat in which he ſlept received a ſmart ſhock, and ſeemed to be lifted out of the water; but this ſhock was unaccompanied with noiſe.

The town of Monteleone is ſituated on a hill which overlooks ſome fine rich plains and the ſea below. Theſe plains, formerly covered with numerous towns and villages, now exhibited a gloomy ſcene of utter deſolation. The town of Monteleone itſelf had not ſuffered materially from the firſt ſhock on the 5th of February; but it was conſiderably damaged by ſome of theſe which took place afterwards. It was generally obſerved, that the ſhocks of the earthquake came on with a rattling noiſe, which ſeemed to proceed from the weſtward. They uſually began with a horizontal motion, and terminated with a whirling motion, during which moſt of the buildings in the province were thrown down. It was generally obſerved too, that previous to a ſhock the

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clouds ſeemed to be unuſually ſtill and motionleſs, and that a ſhock quickly ſucceeded a heavy ſhower of rain.

Approaching the plain, it was obſerved, according to the general remark made above, that the towns and villages were more or leſs deſolated in proportion to their vicinity to the plain. Of the town of Mileto, which ſtood in a bottom, not a houſe remained. Soriano and the noble Dominican convent preſented a heap of ruins. According to the ſame general remark, all the buildings which ſtood upon the high grounds, the ſoil of which is a gritty ſandſtone, ſuſtained leſs damage than thoſe ſituated in the plain, for the latter were univerſally thrown down. The ſoil of the plain is a ſandy clay of various colours, and full of ſea ſhells. It is frequently interſected by rivers and torrents which have formed wide and deep ravines. Paſſing through St Pietro, a town in ruins, Sicily was ſeen and the ſummit of Mount Ætna, which at this time threw out a conſiderable quantity of ſmoke. In a ſwampy plain through which he paſſed, Sir William examined a number of ſmall holes in the earth, of the ſhape of an inverted cone. Theſe holes were covered with ſand as well as the ſurrounding ſoil. During the earthquake of the 5th of February, water mixed with ſand ſpouted up to a conſiderable height from each of theſe openings. The river, it was obſerved, before theſe fountains burſt out, was dried up; but ſoon after the waters returned, and overflowed their banks. It appeared from more extenſive obſervation, that the ſame thing had uniformly happened to all the other rivers in the plain during the ſhock of the 5th of February. This has been aſcribed to the firſt impulſe of the earthquake proceeding from the bottom upwards, and this ſeemed to be the general opinion. The ſurface of the plain then riſing ſuddenly, the rivers which are ſhallow naturally diſappeared; and the plain returning with violence to its former level, the rivers returned and overflowed from the ſudden depreſſion of the boggy grounds, which would naturally force out the water under their ſurface.

The town of Roſarno, and the duke of Montelcone's palace, was a heap of ruins; ſix feet high of the walls only remained. It was ſomewhat ſingular, that the only building which eſcaped uninjured was the public jail. At Laureana Sir William aſcertained the truth of the circumſtance of the two tenements which were ſaid to have been removed from their ſituations. Theſe ſtood in a valley ſurrounded with high grounds. In the ſame valley were obſerved hollows in the form of inverted cones ſimilar to thoſe which he had formerly examined. Between this place and the town of Poliſtene he did not ſee a ſingle houſe, after travelling four days through a rich and beautiful country. Every thing preſented the moſt indeſcribable miſery: the violence of the earthquake was ſo great that all the inhabitants were buried in an inſtant alive or dead in the ruins of their houſes. This town was ſituated between two rivers that were occaſionally ſubject to overflow their banks. Of ſix thouſand inhabitants, more than two thouſand loſt their lives by the ſhock on the 5th of February.

The princeſs Gerace Grimaldi, with four thouſand of her ſubjects, periſhed at Caſal Nuova on the ſame day; ſome perſons who were dug alive out of the ruins obſerved, that they felt their houſes fairly lifted up without any previous warning. An inhabitant of this town, being at that moment on a hill which overlooked the plain, when he felt the ſhock turned round towards the town, but he could ſee nothing excepting a thick white cloud of duſt. So completely was this town deſtroyed, that no veſtige of houſe or ſtreet remained; all lay in the ſame confuſed heap of ruins. Other towns had ſuffered in the ſame manner, and now exhibited the ſame ſcene of deſolation.

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Terra Nuova ſuffered ſeverely from the ſame earthquake. It is ſituated between two rivers which had formed deep and wide ravines in their courſe; one of theſe was not leſs than 500 feet deep, and three quarters of a mile broad. In conſequence of the great depth of this ravine, and the violent motion of the earth, two large maſſes of the ſoil on which a great part of the town, conſiſting of ſome hundred houſes, had been thrown into the ravine at the diſtance of half a mile from the place where they formerly ſtood. Many of the inhabitants who had been carried along with their houſes, were dug out of the ruins alive, and even ſome of them eſcaped unhurt. Of 1600 inhabitants, 400 only remained alive. In other places in the ſame neighbourhood, great tracts of land had been removed and carried to a conſiderable diſtance, with all their plantations and crops, which continued to grow and thrive in their new ſituation as well as formerly. The river here diſappeared at the moment of the earthquake; but ſoon after returned, and covered the bottom of the ravine to the depth of three feet. This water was obſerved to be ſalt like that of the ſea.

The whole town of Molochi di Sotto had been thrown into the ravine, and a vineyard of many acres lay near it in an inclined ſituation, but had not ſuffered any other injury. In ſeveral parts of the plain, the ſoil, with all its trees and crops of corn, to the extent of many acres, had ſunk eight and ten feet below the level of the plain; and in other places it had riſen the ſame height. The ſoil of this plain, it is to be obſerved, is compoſed of clay mixed with ſand, which readily aſſumes any form.

222 Deſtruction of Oppido.

Sir William next proceeded to Oppido, which, it will be recollected, was conſidered as the central point on which the greateſt force of the earthquake was exerted. This city ſtands on a mountain of gritſtone of a reddiſh colour. It is ſurrounded by two rivers, which run in a deep ravine. It had been reported, that the mountain on which the city ſtands, had been ſplit in two, and ſtopped up the courſe of the rivers; but it appeared on examination, that huge maſſes of the plain on the edge of the ravine, had been detached into it, and had ſo far filled it up, as to ſtop the courſe of the rivers, the waters of which were collecting, and forming lakes to a great extent. Part of the rock, it was found, on which the city ſtood, was ſeparated, and with ſeveral houſes upon it, was thrown into the ravine. Great tracts of land, with plantations of vines and olives, were tranſported from one ſide of the ravine to the other, to a diſtance exceeding half a mile.

"Having walked, (ſays Sir William), over the ruins of Oppido, I deſcended into the ravine, and examined carefully the whole of it. Here I ſaw, indeed, the wonderful force of the earthquake, which has produced exactly the ſame effects as thoſe deſcribed in the ravine at Terra Nuova, but on a ſcale infinitely greater. The enormous maſſes of the plain detached from each ſide

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of the ravine, lie ſometimes in confuſed heaps, forming real mountains, and having ſtopped the courſe of two rivers (one of which is very conſiderable), great lakes are already formed; and if not aſſiſted by nature or art ſo as to give the rivers their due courſe, muſt infallibly be the cauſe of a general infection in the neighbourhood. Sometimes I met with a detached piece of the ſurface of the plain (of many acres in extent) with the large oaks and olive trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine, as their companions from whence they were ſeparated do on their native ſoil, at leaſt 500 feet higher, and at the diſtance of about three quarters of a mile. I met with whole vineyards in the ſame order in the bottom, that had likewiſe taken the ſame journey. As the banks of the ravine from whence theſe pieces came are now bare and perpendicular, I perceived that the upper ſoil was a reddiſh earth, and the under one a ſandy white clay, very compact, and like a ſoft ſtone. The impulſe theſe huge maſſes received, either from the violent motion of the earth alone, or that aſſiſted with the additional one of the volcanic exhalations ſet at liberty, ſeems to have acted with greater force on the lower and more compact ſtratum than on the upper cultivated cruſt: for I conſtantly obſerved, where theſe cultivated lands lay, the under ſtratum of compact clay had been driven ſome hundred yards farther, and lay in confuſed blocks; and, as I obſerved, many of theſe blocks were in a cubical form. The under ſoil, having had a greater impulſe, and leaving the upper in its flight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at preſent in the bottom of the ravine.

"In another part of the bottom of the ravine there is a mountain compoſed of the ſame clay ſoil, and which was probably a piece of the plain detached by an earthquake at ſome former period: it is about 250 feet high, and 400 feet diameter at its baſis. This mountain, as is well atteſted, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the freſh detached pieces of the plain which I ſaw heaped up at the back of it, the nature of the ſoil of which it is compoſed, and particularly its ſituation on a declivity, account well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found ſome ſingle timber trees alſo with a lump of their native ſoil at their roots, ſtanding upright in the bottom of the ravine, and which had been detached from the bottom of the plain above mentioned. I obſerved alſo, that many confuſed heaps of the looſe ſoil, detached by the earthquake from the plains on each ſide of the ravine, had actually run like a volcanic lava (having probably been aſſiſted by the heavy rain), and produced many effects much reſembling thoſe of lava during their courſe down a great part of the ravine. At Santa Chriſtina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February ſeems to have been exerted on theſe parts, and at Caſal Nuova, and Terra Nuova.

The next places which were viſited were the towns of Seminara and Palmi. Palmi is nearer the ſea, and had ſuffered moſt; not fewer than 1400 of the inhabitants having been deſtroyed. In the courſe of his tour in this part of the country, he was informed that the ſea was obſerved to be hot, and fire was ſeen iſſuing from the earth.

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At Reggio, although the ſhock had been much leſs violent than in other places, no houſe was yet habitable. During the earthquakes which viſited this place in 1770 and 1780, near 17,000 inhabitants lived for ſeveral months encamped in the fields, or in barracks.

Having examined the different places on the Calabrian coaſt, which had ſuffered from this terrible earthquake, Sir William Hamilton ſailed for Meſſina in Sicily, to be informed of its effects there. He found that the ſhock had been very violent, but far leſs ſo than on the oppoſite ſhores. Many of the houſes, even in the lower part of the town, were ſtanding, and ſome of them had ſuſtained little damage; but in the more elevated ſituations the ſhocks ſeemed to have had ſcarcely any effect. This ſtill correſponds with the general remark, which was already made. A ſtriking inſtance of this appeared in two convents, which are ſituated on elevated places, and had ſuffered nothing from the earthquakes which had afflicted the country for four months. It was ſaid that fire had been ſeen iſſuing from fiſſures of the earth near the ſhore. The ſhock of the earthquake on the 5th of February, ſeemed to proceed from the bottom upwards; but the ſucceeding ſhocks came on with a horizontal or whirling motion.

A remarkable circumſtance with regard to fiſh, was taken notice of at Meſſina, and indeed the ſame thing was obſerved along the coaſt of Calabria, where the effects of the earthquake had been moſt ſevere. A ſmall fiſh, ſomewhat larger than the Engliſh white bait, but reſembling it, and which uſually lies at the bottom of the ſea, buried in ſand, had remained for ſeveral months after the commencement of the earthquakes, near the ſurface, and was taken in great abundance to be the common food of poor people. Before the earthquake, this fiſh was extremely rare, and was conſidered as a great delicacy. After the earthquake, indeed, it was obſerved, that fiſh of all kinds were found in greater abundance.

Theſe earthquakes, of which we have now given ſo detailed an account, continued for many months afterwards; tremulous motions of the earth continued to be felt, and they were not perfectly ſettled even in the year 1784.

223 Earthquakes in Peru.

The ſouthern continent of America is often viſited by earthquakes. In the year 1797, Peru was afflicted with this dreadful calamity, which perhaps in the extent of ſurface which experienced the dreadful ſhock, exceeds that of any earthquake, the hiſtory of which is on record. The following is a ſhort account of this earthquake by M. Cavanilles. "In the midſt, (ſays he), of the moſt profound calm, there is frequently heard a dreadful bellowing noiſe, the forerunner of earthquakes, to which this part of the world is often expoſed. After the year 1791, this noiſe was frequently heard in the neighbourhood of the mountain of Tunguragua. Antonio Pineda and Née, the two naturaliſts employed in the expedition round the world, when examining the declivity of this volcano, the lava of which had been hardened more by the internal fire than

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than by the ardour of the ſun, were ſtruck with terror by the horrible ſound which they heard, and the heat which they experienced. Pineda, that valuable member of ſociety, whoſe premature death is ſtill deplored by the friends of ſcience, foretold that a terrible eruption was preparing in the mountain of Tunguragua; and his conjectures were confirmed by the event. On the 4th of February 1797, at three quarters paſt ſeven in the morning, the ſummit of the volcano was more free from vapours than uſual; the interior part of the mountain was agitated by frequent ſhocks, and the adjacent chains burſt in ſuch a manner, that in the ſpace of four minutes an immenſe tract of country was convulſed by an undulating movement. Never did hiſtory relate the effects of an earthquake ſo extraordinary, and never did any phenomenon of nature produce more misfortunes, or deſtroy a greater number of human beings. A number of towns and villages were deſtroyed in a moment: ſome of them, ſuch as Riobamba, Quero, Pelileo, Patate, Pillaro, were buried under the ruins of the neighbouring mountains; and others in the juriſdictions of Harnbata, Latacunga, Guaranda, Riobamba, and Alauſi, were entirely overthrown. Some ſuſtained prodigious loſs by the gulfs which were formed, and by the reflux of rivers intercepted in their courſe by mounds of earth; and others, though in part ſaved, were in ſuch a ſhattered ſtate as to threaten their total ruin. The number of perſons who periſhed during the firſt and ſucceeding ſhocks is eſtimated at 16,000. At ten o'clock in the morning, and four in the afternoon, the ſame day, (February 4.) after a dreadful noiſe, the earth was again agitated with great violence, and it did not ceaſe to ſhake, though faintly, for the whole months of February and March; but, at three quarters paſt two in the morning of the 5th of April, the villages already ruined were again expoſed to ſuch violent ſhocks as would have been ſufficient to deſtroy them. This extraordinary phenomenon was felt throughout the extent of 140 leagues from eaſt to weſt, from the ſea as far as the river Napo; and without doubt farther, for we are little acquainted with theſe diſtricts which are inhabited by the ſavages. The diſtance north-eaſt and ſouth-weſt between Popayan and Piura, is reckoned to be 170 leagues; but in the centre of that diſtrict, 1 degree 16.6 from theſe places, is ſituated the part totally deſtroyed, and which comprehends 40 leagues from north to ſouth between Guarandam and Machache, and twenty leagues from eaſt to weſt. But, as if an earthquake alone had not been ſufficient to ruin this fertile and populous country, another misfortune, hitherto unknown, was added. The earth opened, and formed immenſe gulfs; the ſummits of the mountains tumbled down into the valleys, and from the fiſſures in their ſides there iſſued an immenſe quantity of fetid water, which in a little time filled up valleys a thouſand feet in depth and ſix hundred in breadth. It covered the villages, buildings, and inhabitants; choked up the ſources of the pureſt ſprings, and being condenſed by deſiccation, in the courſe of a few days into an earthy and hard paſte, it intercepted the courſe of rivers, made them flow backwards for the ſpace of 87 days, and converted whole diſtricts of dry land into lakes. Very extraordinary phenomena, which will doubtleſs be one day mentioned in hiſtory, occurred during theſe earthquakes; I ſhall, however, content myſelf with mentioning only two of them. At the ſame moment that the earth ſhook, the lake of Quirotoa, near the village of Inſiloe, in the juriſdiction of Latacunga, took fire, and the vapour which roſe from it ſuffocated the cattle and flocks that were feeding in the neighbourhood. Near the village of Pelileo, a large mountain named Moya, which was overturned in an inſtant, threw out a prodigious ſtream of the before-mentioned thick fetid matter, which deſtroyed and covered the miſerable remains of that city. Naturaliſts will one day find, in theſe ravaged countries, objects worthy of their reſearches. Fragments of the minerals and earths of Tunguragua are about to be tranſported to Spain: but it is not in ſuch fragments that we ought to ſearch for the cauſe of theſe ſurpriſing phenomena; we muſt viſit the country itſelf, where this conflict of the elements took place, and where the ruins it occaſioned are ſtill to be ſeen (G)."

224 In Scotla

To the hiſtory of earthquakes now given, we ſhall only add the following account of the earthquakes which have taken place at Comrie in Perthſhire, in Scotland, which was communicated to the Royal Society of Edinburgh, by Dr Finlayſon, in a letter from Mr Taylor.

"The earthquakes which have lately (January 1790) taken place at Comrie (H) and its neighbourhood, are certainly very deſerving of attention. I ſhall therefore cheerfully comply with your requeſt, and give you as particular a deſcription as I can of ſuch of them as have been moſt remarkable. To give a particular account of all the noiſes or concuſſions which, during the laſt half year, have been heard or felt at Comrie, and within a ſhort diſtance to the north, eaſt, and weſt of that village, is beyond my power, and would indeed be of little uſe. With regard to theſe ſmall concuſſions, it will be ſufficient to ſay, that many of them have ſometimes been obſerved to ſucceed one another in the ſpace of a few hours; that they take place in all kinds of weather; that they are thought by ſome people to proceed from north-weſt to ſouth-eaſt, and by others from north-eaſt to ſouth-weſt; that they have not been obſerved to affect the barometer; that they do not extend in any direction above three or four miles from Comrie; and that towards the ſouth they are bounded by the Earn, which is in the immediate vicinity of the village. The ſame perſon, though beſtowing the minuteſt attention, is often uncertain whether they proceed from the earth

(G) The volcano of Tunguragua occaſioned an earthquake in 1557.

(H) Comrie is a village about 22 miles weſt of Perth, ſituated in the valley of Strathearn, and on the north ſide of the river Earn, about four miles below the place where it iſſues from the lake. The remains of a Roman camp on the oppoſite ſide of the river, have made the name of this village very well known to Scottiſh antiquaries.

earth or from the air, ſometimes believing them to come from the one, and ſometimes from the other; neither do all agree with reſpect to the ſeat of any one of them.

" After the ſtricteſt inquiry, I find it impoſſible to determine with accuracy the date of any of the concuſſions which took place before the 2d of September laſt. Some people in the neighbourhood of Killin aſſert poſitively, that they heard unuſual rumbling noiſes in the month of May; but the impreſſion which theſe noiſes made was ſo faint, that they would probably have been ſoon forgotten altogether, had they not been ſucceeded by concuſſions of a leſs equivocal nature. Towards the end of Auguſt, two or three ſhocks are ſaid to have been felt at Dundurn, Dunira Lodge and Comrie; but I have not been able to learn the preciſe day or hour on which any of them happened. The truth is, the concuſſions hitherto obſerved were feeble, and the minds of the people ſeem not to have been rouſed to particular attention till the 2d of September. About eleven o'clock that evening, a ſmart ſhock was felt at Comrie. I myſelf heard here, for the firſt time, a rumbling noiſe, which I took for that of a large table, dragged along the floor above ſtairs, and which I probably would never have thought of again, unleſs my attention had been turned to it by the alarm which it had excited in the neighbourhood. Many other feeble noiſes or concuſſions are ſaid to have been obſerved in Glen Leadnach and about Comrie during the months of September and October. At that time, however, I confeſs I was diſpoſed to doubt the numerous reports of earthquakes with which the country was filled, and to aſcribe them to the workings of an imagination, on which the alarm of the 2d of September ſtill continued to be impreſſed.

" On the 5th of November, a concuſſion took place two or three minutes before ſix o'clock P. M. which was too violent to be miſtaken. Some compared the noiſe which accompanied it to that of heavy loaded waggons, dragged with great velocity along a hard road or pavement, and thought that it paſſed under their feet. To me it ſeemed as if an enormous weight had fallen from the roof of the houſe, and rolled with impetuoſity along the floor of the rooms above; and it muſt have made a ſimilar impreſſion on the ſervants, for ſome of them inſtantly ran up ſtairs to diſcover what had happened. Others were ſenſible of a tremulous motion in the earth, perceived the flames of the candles to vibrate, and obſerved the mirrors and kitchen utenſils placed along the walls to ſhake and clatter. There is alſo reaſon to believe that the waters in the loch of Monivaird, in the near neighbourhood of Ochtertyre, ſuffered unuſual agitation, as the wild fowl then upon the loch were heard to ſcream and flutter. The noiſe on this occaſion, as far as I can judge, did not laſt above ten or twelve ſeconds. During the courſe of the day, the mercury in the barometer roſe and fell ſeveral times, and at ſix o'clock it ſtood at 28¼ inches. The ſky was then perfectly ſerene, and hardly a breath of wind was to be felt; but next morning, about ſix o'clock, a violent tempeſt roſe, which raged without intermiſſion for 24 hours.

" At Glen Leadnach, Comrie and Lawers, this concuſſion was much more violent, and the noiſe that accompanied it much more alarming. The inhabitants of theſe places, and of Aberuchill and Dunira, declare, that they perceived diſtinctly the earth heaving under them, and the motion communicated to their chairs, and other furniture. They imagined that the ſlates and ſtones were tumbling from their houſes, and many of them ran out in the greateſt trepidation, from the notion, that the roofs were falling in. Even the domeſtic animals were alarmed, and contributed, by their howls and ſcreams, to increaſe the terrors of the people. Though I have not been able to diſcover whether Loch Earn was ever agitated by theſe concuſſions, there is little doubt, that the river near Comrie was affected on this occaſion, as two men then on its banks heard the daſhing of its waters. This great ſhock was ſucceeded by a number of thoſe ſlighter rumbling noiſes which have been already mentioned. Not leſs than 30 of them were counted in the ſpace of two hours after it happened; but they did not extend above two miles to the eaſt, north, and weſt of Comrie.

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" On the 10th of November, at three o'clock P. M. we had here another ſhock of much the ſame length, violence, and extent, as that on the 5th. The mercury in the barometer on this day was more ſtationary than on the former, and at the time of the earthquake was 29 inches high. The weather was calm and hazy. It was a market-day at Comrie; and the people, who were aſſembled from all parts of the country, felt as if the mountains were to tumble inſtantly upon their heads. The hard-ware expoſed for ſale in the ſhops and booths ſhook and clattered, and the horſes crowded together with ſigns of unuſual terror.

" About one o'clock P. M. of the 29th December, we had another pretty ſmart ſhock, during a violent ſtorm of wind and rain, which continued the whole day, and which was at its height during the time of the earthquake. Indeed, as has been remarked already, theſe concuſſions ſeem to have no dependence on the weather. According to the accounts of thoſe who live neareſt to the centre of the phenomena, rumbling noiſes, like thoſe above deſcribed, may be heard in all ſtates of the atmoſphere.

" Though I mention no more of theſe earthquakes, you are not to conclude, that many more have not taken place, and ſome of them perhaps equally violent with thoſe of the 5th and 10th of November. Several ſhocks have happened during the ſtillneſs of the night, which, even at this diſtance from Comrie, where their centre ſeems to be, have been abundantly terrifying. But the great reſemblance, or rather the perfect ſimilarity of their effects, and of the impreſſion they make on our minds, renders it unneceſſary for me to trouble you with a particular deſcription of each of them.

" The direction of all the noiſes or concuſſions I have obſerved, great as well as ſmall, appeared to be in the ſame line from N. W. to S. E. Others deſcribe them as ſometimes proceeding in that direction, and ſometimes as coming from N. E. to S. W. I have not heard any other line of direction aſcribed to them.

" Upon the fulleſt enquiry, I find, that theſe earthquakes have been very limited in point of extent. The greater ſhocks have been feebly felt at Loch Earn head, about Killin, and at Ardonich, on the ſouthern bank of Loch Tay. They do not appear to have extended farther eaſtward on that lake; and, what is more remarkable, they have not been felt in Glen Almond,

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mond, or the ſmall glen through which the military road from Crieff to Tay-bridge paſſes. The farmer at Auchnaſree, (which lies at the head of Glen Almond, and is ſeparated from Glen Leadnach only by the mountain Benechoni, over the northern ſide of which his ſhepherds daily travel), has aſſured me, that neither he, nor any of his people, have been at any time ſenſible of the leaſt extraordinary noiſe or concuſſion. Towards the eaſt, the two firſt great ſhocks extended to Monzie, Cultoquhey and Dollary, about ſeven miles diſtant from Comrie. The ſhock of the 5th of November reached ſtill farther, and was felt, though but faintly, at Ardoch and Drummond Caſtle towards the S. E. In the direction of the ſouth, however, the banks of the Earn ſeem to be its general boundary, as the noiſe of the moſt violent concuſſions was heard but faintly at the manſe of Comrie, and along the ſtrath on the ſouth ſide of the river. The limits of the leſſer concuſſions, I am confident, do not extend above three miles in any direction from their centre. They are commonly obſerved at Lawers on the eaſt; throughout the whole of Glen Leadnach, at Dunira, Dalchonzie and Aberuchill, on the north and weſt; and do not reach ſo far as the manſe, which is about three quarters of a mile on the ſouth of Comrie (1)."

In another communication, dated in 1793, from the ſame gentleman, he obſerves, that "there is no reaſon to believe that theſe phenomena are yet come to an end. After temporary intermiſſions, ſometimes of ſeveral months, they have returned, ever ſince their firſt appearance in 1789, without any apparent difference in their extent or force. The rumbling noiſes or ſlighter concuſſions, as uſual, are obſerved at Comrie, in Glen Leadnach, and the places in their near neighbourhood; the more violent extend to much the ſame diſtance as formerly deſcribed. Having been only occaſionally in that country ſince February 1791, I have not been able to aſcertain dates. On the 2d of September 1791, at five minutes paſt five in the afternoon, a ſlight ſhock was felt at Ochtertyre. The barometer was not in order, on which account the weight of the atmoſphere could not be aſcertained. Its electrical ſtate was tried by Sauſſure's electrometer, but no indication of any thing uncommon was perceived. Since that period, ſhocks have been obſerved at different times till within theſe few weeks paſt.

"From this account, it will be obſerved, that all the greater ſhocks have taken place in the ſeaſon of autumn or the beginning of winter; that this has been now repeated for more than four years; and that thoſe greater ſhocks have been ſucceeded at ſhort intervals by rumbling noiſes or more feeble concuſſions. It has alſo been remarked, that they have in general been preceded or followed by great rains or boiſterous weather; but variations in the weather take place ſo frequently in our climate at that ſeaſon of the year, that the connection between them and the phenomena above deſcribed, is probably altogether accidental."

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225 Cauſes of earthquakes,

After the view which we have given of the phenomena and hiſtory of earthquakes, we now proceed to the conſideration of the cauſes, by the operation of which, according to the ſpeculations of philoſophers, theſe terrible convulſions of nature, which ſpread ruin and deſolation in ſome of the faireſt portions of the earth, are to be accounted for. Various opinions have been formed, and various hypotheſes have been propoſed, for the explanation of theſe dreaded phenomena. According to ſome of the ancient philoſophers, ſubterraneous clouds exiſted in the internal cavities of the earth, and theſe burſting into lightning, ſhook and demoliſhed the vaults which contained them. This was

226 according to the ancients;

the opinion of Anaxagoras. It was ſuppoſed by others, that earthquakes were owing to the falling in of immenſe arched roofs, which confined ſubterraneous fires; the vaults or arches being weakened by the conſtant burning of theſe fires. Some aſcribed earthquakes to the vapour of water which was produced, and greatly rarefied, by means of internal fires, while others, among whom was Epicurus and ſome of the peripatetic philoſophers, ſought for the explanation of the phenomena of earthquakes, in the exploſion of certain inflammable ſubſtances, which were exhaled from the internal cavities of the earth.

227 the moderns.

Some of the modern philoſophers, as Gaſſendi, Kircher, Varenius, Des Cartes, and others, have adopted the laſt hypotheſis, according to which it is ſuppoſed, that there are immenſe cavities in the earth, communicating with each other. Some of theſe cavities contain water, and others contain vapours and exhalations, ariſing from bituminous, ſulphureous, and other inflammable ſubſtances. Theſe combuſtible materials being kindled by ſome ſubterraneous ſpark, or by ſome actual flame, proceeding through narrow fiſſures from without, or by the heat evolved during the mixture of different ſubſtances, and the formation of new ones, produce commotions on the ſurface of the earth, according to the extent of the cavities, and the quantity and active nature of the inflamed matter. Thoſe who ſupport

(1) "The tract within which the concuſſions deſcribed in this letter appear to have been confined, is a ſpace of a rectangular form, which extends from eaſt to weſt along the north ſide of the Earn about 22 miles in length, by a little more than five in breadth; reckoning the utmoſt length from about Monzie to the head of Loch Tay, and the breadth from a little ſouth of the Earn northward to the ridge which ſeparates the branches of that river from thoſe of the Almond. The whole of this tract is mountainous, except toward the eaſtern extremity, where it joins the low country, and on the banks of the river Earn on the ſouth. It is interſected by narrow glens or valleys, the moſt conſiderable of which is Glen Leadnach, where the centre of the concuſſions ſeems to be placed. The mineralogy of this part of the country has not hitherto been accurately examined; but it is known in general, that the ſtone is the primary ſchiſtus, and in ſome places granite; that no mineral veins, nor any hot ſprings, have been found in it, and that no volcanic appearances have been obſerved. In the valleys, among the mountains, iron ore, of the kind that is called bog ore, is ſaid to abound. Dr Hutton has remarked, that the line which terminates this tract on the ſouth-eaſt, ſeems to be nearly the ſame with that where the primary ſtrata ſink under the ſurface, and are covered by the ſecondary or horizontal ſtrata. *Note by Mr Playfair.*"

support this hypothefis think, that it receives illuftration from a common experiment of mixing together iron filings and fulphur, and burying them in the earth; and in conſequence of the chemical action of theſe ſubſtances on each other, and the elaſtic vapours thus produced, the ſhaking of the earth is effected.

228 Hypotheſis of Woodward.

A different hypotheſis has been propoſed by Dr Woodward. According to this hypotheſis, water is continually raiſed by means of ſubterraneous heat, from the abyſs which he ſuppoſes to occupy the centre of the earth, to furniſh rain and dew. Obſtructions may take place in this proceſs of nature, and whenever this happens, a ſwelling and commotion are occaſioned by the heat in the waters of the abyſs. This force is at the ſame time exerted againſt the incumbent ſtrata, and thus the agitation and concuſſion, with the other phenomena which accompany earthquakes, are produced.

229 Of Amontons.

Another hypotheſis, different from any of theſe, has been propoſed by M. Amontons, of which the following explanation is given. The atmoſphere being taken at 45 miles high, and the denſity of the air increaſing in proportion to the abſolute height of the ſuperincumbent column of fluid, it is ſhewn that at the depth of 43,528 fathoms below the ſurface of the earth, the air is but one-fourth lighter than mercury. But this depth is only about one ſeventy-fourth of the ſemidiameter of the earth. The immenſe ſphere beyond this depth, the diameter of which is 6,451,538 fathoms, may perhaps be only filled with air: this air muſt be here greatly condenſed, and heavier than the heavieſt bodies with which we are at preſent acquainted. It is found by experiment, that the more air is compreſſed, the more do equal degrees of heat increaſe its elaſtic force, and the more capable it becomes of producing violent effects. As, for inſtance, the temperature of boiling water increaſes the elaſticity of the air beyond its natural force in temperate climates, by a quantity equal to one-third of the weight with which it is preſſed. Hence it is concluded, that a degree of heat which on the ſurface of the earth produces only a moderate effect, may occaſion violent convulſions by the rarefaction of the denſer air at great depths; but if it be conſidered that this condenſed air may be expoſed to much higher degrees of heat than that of boiling water, the elaſtic force of the air thus produced, and aſſiſted by the great weight of a high column, may be more than ſufficient to convulſe and break up the ſolid orb of 43,528 fathoms, the weight of which, comparing it with that of the included air, would be trifling.

Theſe hypotheſes, however inſufficient they may appear for explaining in a ſatisfactory manner the phenomena of earthquakes, were generally adopted till about the middle of the 18th century, when the knowledge of electricity began to be cultivated and extended. This principle was applied ſucceſſively in the explanation of many natural phenomena, and, among others, the phenomena of earthquakes were aſcribed to the ſame principle. An earthquake which was felt at London in the month of March 1749, directed the attention of philoſophers to this explanation. The firſt who made this attempt, we believe, was Dr Stukeley, who had been much occupied about that time with electrical experiments. The conſideration of the phenomena which accompanied this earthquake, led him to ſuppoſe that it could not be occaſioned by vapours generated in the cavities of the earth, or by any proceſs like fermentation, in which elaſtic fluids are formed and diſengaged, to which ſuch effects could be aſcribed. He is of opinion, that no evidence has yet been brought to eſtabliſh the probability of the exiſtence of extenſive cavities within the earth. On the contrary, he thinks there is good reaſon to preſume, that it is in a great meaſure ſolid, ſo that there is little ſpace for thoſe changes which are ſuppoſed to be effected within the cavities, to take place. Coal pits, he adds, which have been frequently known to be on fire, and for a great length of time, never exhibited any of the phenomena which accompany an earthquake on the ſurface of the ground above.

230 Of Stukeley.

The earthquake which viſited London and other places of Britain, in March 1749, was felt in a circuit of 30 miles diameter; but there was no eruption of fire or vapour, and it was unattended with ſmoke or ſmell. From this conſideration alone, of the extent of ſurface which felt the effects of the earthquake, he ſuppoſes that it could not be aſcribed to the expanſive force of ſubterraneous vapours; for, he obſerves, ſmall fire-balls which are exploded in the air, emit a ſulphureous ſmell to the diſtance of ſeveral miles. Now, it cannot be imagined, that ſo prodigious a force, acting inſtantaneouſly, on ſo great an extent of ground, ſhould neither break the ſurface, nor indicate its preſence either by the ſight or ſmell. But if this effect is to be aſcribed to fermentation, this proceſs is not inſtantaneous; it continues many days, and the evaporation of ſuch a quantity of inflammable matter would require a long ſpace of time. Such an effect, therefore, can only be accounted for on electrical principles, the operation of which is always inſtantaneous.

If earthquakes were occaſioned by vapours and ſubterraneous fermentations, exploſions and eruptions, ſuch proceſſes would entirely deſtroy ſprings and fountains, wherever they had once exiſted. This, however, is contrary to what happens, for although ſprings are ſtopped, or otherwiſe changed, previous to an earthquake, or about the time it happens, they very often recover their former ſtate. In the great earthquake which happened A. D. 17, in Aſia Minor, and which ſhook a maſs of earth 300 miles in diameter, and deſtroyed 13 great cities, neither the ſprings nor the face of the country received any injury.

If it be conſidered, that a ſubterraneous power capable of moving 30 miles in diameter, as in the earthquake mentioned above, which happened at London, muſt exiſt and operate at leaſt 15 or 20 miles under the ſurface, the hypotheſis of earthquakes being occaſioned by the force of vapours will be found totally inapplicable, becauſe this force muſt move an inverted cone of ſolid earth, the baſe of which is 30 miles in diameter, and the axis 15 or 20. This is an effect which is impoſſible to any known natural power, excepting that of electricity.

But beſides, no ſubterraneous exploſion can account for the ſingular effects of an earthquake on ſhips that are far out in the ocean. It has been already obſerved, that they ſeem as if they ſtruck on a rock, or as if ſome ſolid body ſtruck againſt their bottom. Even fiſhes, it is found, are particularly affected by the ſhock of an earthquake; but a ſubterraneous exploſion could only produce on the water a gradual ſwell. It could not

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communicate to it that impulſe by which it produces effects, as if it were a ſtone projected with great force againſt ſolid bodies.

From the conſideration of all theſe circumſtances, Dr Stukeley is of opinion, that the phenomena of earthquakes can only be ſatisfactorily explained on electrical principles. He was particularly led to this opinion by directing his attention to the phenomena which accompanied the earthquakes which took place in England in 1749 and 1750. For five or ſix months previous to this time, the weather had been unuſually warm; the wind was from the ſouth and ſouth-weſt, and there had been no rain, ſo that the earth was particularly prepared to receive an electrical ſhock. The flat country of Lincolnſhire had ſuffered greatly from extreme drought, and hence, as dry weather is favourable to electricity, earthquakes and other ſimilar phenomena are more frequent in ſouthern regions of the world. Before the earthquake at London, all vegetables had been unuſually premature, and it is well known how much electricity quickens vegetation. About the ſame time the aurora borealis had been very frequent. A very ſhort time before the earthquake, it had exhibited unuſual colours, and its motions were to the ſouth, contrary to the ordinary direction. From theſe circumſtances an earthquake was predicted by Italians and others who had been accuſtomed to the appearances which precede them. During this year, too, meteors of different kinds, as fire-balls, lightnings, and coruſcations, had been common; and particularly it was obſerved in the night preceding the earthquake, and early in the morning on the day on which it happened, that coruſcations were very frequent. In theſe circumſtances nothing was wanting to produce an earthquake, according to this hypotheſis, but the touch of a non-electric body. This body muſt be derived from the air or atmoſphere; hence it is inferred, that if a non-electric could diſcharge its contents upon any part of the earth, in this prepared and highly electrical ſtate, a violent commotion or earthquake muſt be produced; and as the diſcharge from an excited tube produces a ſhock on the human body, ſo the diſcharge of electric matter from an extent of many miles of ſolid earth, muſt produce an earthquake. The rattling, uncouth noiſe which attends it, is to be aſcribed to the ſnap which is occaſioned by the contact.

Before the earthquake alluded to came on, a black cloud ſuddenly covered the atmoſphere to a great extent; the diſcharge of a ſhower, according to this hypotheſis, probably occaſioned the ſhock; and as the electrical ſnap precedes the ſhock, a ſound was obſerved to roll from the Thames towards Temple-bar, before the motion of the houſes ceaſed. This noiſe, which is generally the forerunner of earthquakes, it is ſuppoſed can only be accounted for on the principles of electricity. The contrary to this would take place, were theſe phenomena owing to ſubterraneous eruptions. The flames and ſulphureous ſmells which accompany earthquakes, might, it is thought, be more eaſily accounted for on the ſame principles, than by eruptions from the bowels of the earth. The ſudden concuſſion, too, ſeems to be produced by a motion which could only be excited by electricity, not proceeding from any convulſion in the interior parts of the earth, but from a uniform vibration along its ſurface, like that of a muſical ſtring, or like the vibratory motion of a glaſs, when the edge is rubbed with the finger. From the circumſtance that earthquakes are chiefly fatal to places near the ſea coaſts, along the courſe of rivers, and elevated ſituations, a farther proof is derived, that they depend on the operation of electricity. The courſe or direction which the earthquake above alluded to took, affords an illuſtration of this point. Another argument in favour of the electrical hypotheſis is drawn from the effects of the earthquake, or the ſtate of the weather at the time, on perſons of weak or nervous conſtitutions. To ſome theſe diſorders proved at that time fatal; and its effects, in general, were ſimilar to thoſe of artificial electricity.

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231 Of Beccaria.

A ſimilar hypotheſis was propoſed by Beccaria, to account for the phenomena of earthquakes. He ſuppoſes that the electric matter to which theſe phenomena are owing, is lodged deep in the earth, and that it is this matter diſcharged from the earth, to reſtore the equilibrium or deficiency which the clouds in the atmoſphere have ſuſtained during thunder ſtorms, by giving out their electrical matter to another part of the earth. This, he ſuppoſes, is confirmed by the noiſe reſembling thunder, and the flaſhes of lightning which are perceived during earthquakes.

232 Of Prieſtley.

Dr Prieſtley propoſes to conſtruct, on the principles of Stukeley and Beccaria, an hypotheſis which he thinks will explain the phenomena in a more ſatisfactory manner. For this purpoſe he ſuppoſes the electric matter to be ſome way or other accumulated on one part of the ſurface of the earth, and on account of the dryneſs of the ſeaſon, not eaſily to diffuſe itſelf. It may, as Beccaria ſuppoſes, force its way into the higher regions of the air, forming clouds in its paſſage out of the vapours which float in the atmoſphere, and occaſion a ſudden ſhower, which may farther promote the paſſage of the fluid. The whole ſurface thus unloaded will receive a concuſſion like any other conducting ſubſtance, on parting with or receiving a quantity of the electric fluid. The ruſhing noiſe will likewiſe ſweep over the whole extent of the country; and upon this ſuppoſition alſo, the fluid, in its diſcharge from the country, will naturally follow the courſe of the rivers, and alſo take the advantage of any eminences, to facilitate its aſcent into the higher regions of the air. In making ſome experiments on the paſſage of the electrical fluid over water, he obſerved that it produced a tremulous motion, and therefore he concludes that it muſt receive a concuſſion reſembling that which is given to the waves of the ſea by an earthquake. To try this ſtill farther, he immerſed his hands in water, while an electrical flaſh paſſed over its ſurface, and he felt a ſudden concuſſion, like that which is ſuppoſed to affect ſhips at ſea during an earthquake. The impulſe, which was felt in different parts of the water, was ſtrongeſt near the place where the exploſion was made.

"Pleaſed with this reſemblance of the earthquake, he obſerves, I endeavoured to imitate that great natural phenomenon in other reſpects; and it being froſty weather, I took a plate of ice, and placed two ſticks about three inches high on their ends, ſo that they would juſt ſtand with eaſe; and upon another part of the ice I placed a bottle, from the cork of which was ſuſpended a braſs ball with a fine thread. Then making the electrical flaſh paſs over the ſurface of the ice, which it did

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did with a very loud report, the nearer pillar fell down, while the more remote ſtood, and the ball which had hung nearly ſtill, immediately began to make vibrations, about an inch in length, and nearly in a right line from the place of the flaſh.

"I afterwards diverſified this apparatus, erecting more pillars, and ſuſpending more pendulums, ſometimes upon bladders ſtretched on the mouth of open veſſels, and at other times on wet boards ſwimming in a veſſel of water. This laſt method ſeemed to anſwer the beſt of any; for the board repreſenting the earth, and the water the ſea, the phenomena of them both during an earthquake may be imitated at the ſame time; pillars, &c. being erected on the board, and the electric flaſh being made to paſs, either over the board, over the water, or over them both *."

* *Hiſt. of Elect.* 233

Of Dolomieu.

The ingenious Dolomieu propoſes to account for theſe phenomena on different principles. On this ſubject he makes the following obſervations with regard to the earthquakes which deſolated Calabria in 1783, and the cauſes by which they were produced. "The ſea, ſays he, during the earthquakes of 1783, had little ſhare in the ſhocks on the main land. The maſs of water experienced no general movement, or fluctuation, or oſcillation; the waves did not riſe above their ordinary limits. Thoſe which on the night of the 5th February beat againſt the coaſt of Sicily, and which afterwards covered the point of the Faro of Meſſina, were only the effects of a particular cauſe. The fall of a mountain into the ſea raiſed the waters, which received an undulating motion, as happens always in ſimilar caſes. The undulation reached from the point of Sicily beyond the cape of Roſacolmo, extending in length along the coaſt which runs to the ſouth; but always with a decreaſe in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to diſcover, in all the details which have been given him, any proofs of the exiſtence of electrical phenomena; no ſpark, no diſengagement of the electrical fluid, which the Neapolitan naturaliſts wiſh to aſſign as the cauſe of earthquakes.

"The ſtate of the atmoſphere was not the ſame in the whole range of earthquakes. While the tempeſts and the rain ſeemed to have conſpired with them for the deſtruction of Meſſina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the ſky was clear during the reſt of the day. This month and that of March were not only pretty ſerene, but likewiſe warm. There were ſome ſtorms and rain; but they were the natural attendants of the ſeaſon.

"The moving force ſeems to have reſided under Calabria itſelf, ſince the ſea which ſurrounds it had no ſhare in the oſcillations or vibrations of the continent. This force ſeems alſo to have advanced along the ridge of the Apennines in aſcending from the ſouth to the north. But what power in nature is capable of producing ſuch effects? I exclude electricity, which cannot accumulate continually during the courſe of a year, in a country ſurrounded with water, where every thing conſpires to place this fluid in equilibrio. Fire remains to be conſidered. This element, by acting directly upon the ſolids, can only dilate them; then their expanſion is progreſſive, and cannot produce violent and inſtantaneous movements. When fire acts upon fluids, ſuch as air and water, it gives them an aſtoniſhing expanſion; and we know that then their elaſtic force is capable of overcoming the greateſt reſiſtances. Theſe appear the only means which nature could employ to operate the effects we ſpeak of: but in all Calabria there is no veſtige of a volcano; nothing to point out any interior combuſtion; no fire concealed in the centre of mountains, or under their baſe; a fire which could not exiſt without ſome external ſigns. The vapours dilated, the air rarefied by a heat conſtantly active, muſt have eſcaped through ſome of the crevices or clefts formed in the ſoil; they muſt there have formed currents. Both flame and ſmoke muſt have iſſued by ſome one or other of theſe paſſages. Theſe once opened, the preſſure would have ceaſed; the force not meeting with any more reſiſtance, would have loſt its effect; and the earthquakes could have no longer continued. None of theſe phenomena took place: we muſt then renounce the ſuppoſition of a combuſtion acting directly under Calabria. Let us ſee whether, having recourſe to a fire at ſome diſtance from this province, and acting upon it only as an occaſional cauſe, we ſhall be able to explain all the phenomena which have accompanied the ſhocks. Let us take for example Ætna in Sicily, and ſuppoſe large cavities under the mountains of Calabria; a ſuppoſition which *cannot be refuſed*. It is certain that immenſe ſubterraneous cavities do exiſt, ſince Ætna, in elevating itſelf by the accumulation of its exploſions, muſt leave in the heart of the earth cavities proportioned to the greatneſs of the maſs.

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"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by thoſe of the ſurface, may have run into thoſe caverns which form the focus of Ætna: there they muſt have been converted into vapour capable of the higheſt degree of expanſion, and muſt have preſſed forcibly againſt every thing which oppoſed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occaſion there all the calamities of which I have given the deſcription.

"If the firſt cavity is ſeparated from the ſecond by a wall (ſo to ſpeak) or ſome ſlight diviſion, and this ſeparation is broken down by the force of the elaſtic vapour, the whole force will act againſt the bottom and ſides of the ſecond. The focus of the ſhocks will appear to have changed place, and become weaker in the ſpace which was agitated moſt violently by the firſt earthquake.

"The plain, which was undoubtedly the moſt ſlender part of the vault, yielded moſt eaſily. The city of Meſſina, placed upon low ground, experienced a ſhock which the buildings on higher grounds did not. The moving force ceaſed at once as ſuddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain ſcarce ſuffered any thing. The ſubterraneous noiſe, which preceded and accompanied the ſhocks, appeared always to come from the ſouth-weſt, in the direction of Meſſina. It ſeemed like thunder under ground, which reſounded beneath vaults.

"If Ætna, then has been the occaſional cauſe of the earthquakes, it has alſo prepared, for ſome time, the misfortunes of Calabria, by gradually opening a paſſage along the coaſt of Sicily to the foot of the Neptu-

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nian mountains: for during the earthquakes of 1780, which diſturbed Meſſina the whole ſummer, they felt, for the whole length of that coaſt, from Taormina even to the Faro, conſiderable ſhocks; but near the villages of Alli and Fiume de Niſi, which are ſituated about the middle of that line, ſhocks ſo violent were experienced, that they dreaded leſt the mouth of a volcano ſhould open. Each ſhock reſembled the effort of a mine that had not ſtrength to make an exploſion. It appears, that then the volcano opened a free paſſage for the expanſion of its vapours, and that they have ſince circulated without reſtraint; ſince in the year 1783 the earthquake was almoſt nothing upon that part of Sicily, at the time that Meſſina buried under its ruins the half of its inhabitants."

234 Aſcribed to the force of ſteam.

By others the phenomena of earthquakes have been aſcribed to the force of vapour or ſteam, which, no doubt, is an agent ſufficiently powerful, if it is confined ſo, that its prodigious elaſtic force may be exerted; but it is denied by thoſe who oppoſe this hypotheſis, that earthquakes, though very frequent in regions where ſubterranean fires are really known to exiſt, as in volcanic countries, always happen in ſuch places, and therefore water cannot be converted into vapour. But, beſides, it is well known, that this vapour, even admitting the poſſibility of its production in ſubterranean cavities would be re-converted into water, the moment it came in contact with a cold body, which would deprive it of the principle of heat, in combination with which water aſſumes the form of vapour.

Many objections might have been made to the hypotheſes which have been propoſed to account for earthquakes. Many of theſe will probably occur to the attentive reader, who is a little acquainted with the nature and properties of the agents by which they are ſuppoſed to be produced; but whatever may be the cauſe of theſe extraordinary phenomena, it appears that it is very far from being clearly aſcertained. Perhaps all the agents which have been ſtated as the cauſe of earthquakes, may have ſome influence in contributing to the effect, and many operate at different times, and in different circumſtances.

SECT. II. *Of Volcanoes.*

235 Volcanoes in every part of the world.

VOLCANOES exiſt in almoſt every part of the world, from the north to the ſouth pole. Hecla in Iceland, and a volcano which has been obſerved in Terra del Fuego, at the termination of the ſouthern continent of America, nearly comprehend the extremities of the globe; and having mentioned theſe boundaries, it is unneceſſary to obſerve, that they exiſt in all climates.

236 Number of them.

The number of volcanoes at preſent known, is not leſs than 100. The volcanoes of Europe are well known: theſe are Veſuvius in Italy, Ætna in Sicily, and Hecla in Iceland. To theſe may be added the volcanoes in the Æolian or Lipari iſlands on the coaſt Italy, of which Stromboli is remarkable for having thrown out flames, without the eruption of other volcanic matter, for more than 2000 years. In Aſia there is a volcano in Mount Taurus; five in Kamtſchatka, 10 in the iſlands of Japan; one in the peak of Adam in the iſland of Ceylon; four which have been obſerved in Sumatra; and ſome others in different parts of the Aſiatic continent or iſlands. There are alſo ſome volcanoes on the African continent, as well as in ſome of the iſlands. Volcanoes exiſt alſo in the American continent, and in many of the iſlands which have been diſcovered in the South ſeas.

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237 Are all near the ſea,

Almoſt all volcanoes are in the immediate vicinity of the ſea. Mount Taurus, in the interior of Aſia, and ſome of the volcanoes in the Andes, are the only exceptions to this.

238 and in the tops of mountains.

Another general remark which may be made with regard to volcanoes is, that they always occupy the tops of mountains. No volcano was ever found burſting out in plains. The exiſtence of volcanoes at the bottom of the ocean ſeems to be an exception; but it is to be obſerved, that theſe are alſo in the peaks of mountains, which have been raiſed up from great depths at the bottom of the ocean.

239 Symptoms of an eruption.

The firſt ſymptom of an approaching eruption is an increaſe of the ſmoke, if ſmoke has been emitted, in fair weather. This ſmoke is of a whitiſh colour; but, after ſome time, black ſmoke is obſerved to ſhoot up in the midſt of the column of white ſmoke. Theſe appearances are uſually accompanied with exploſions. The black ſmoke is then followed, at a ſhorter or longer diſtance of time, by a reddiſh-coloured flame. Showers of ſtones are afterwards thrown out, and ſome of them are projected to great heights in the air, which ſhews that the force by which they are impelled is very great. Along with theſe, aſhes are likewiſe ejected. Theſe phenomena, which daily increaſe in frequency and violence, are alſo uſually preceded and accompanied by earthquakes, and hollow noiſes from the bowels of the earth, ſomething like thoſe that precede earthquakes unaccompanied with volcanic eruptions. The ſmoke, flame, and the quantity of ſtones and aſhes, increaſe, and the ſtones are at laſt thrown out red hot.

The ſmoke which iſſues from the crater has been obſerved to be ſometimes in a highly electrified ſtate. The aſhes are ſtrongly attracted, and carried up along with the ſmoke to great heights in the atmoſphere, forming a denſe black column of vaſt height and ſize. Flaſhes of lightning are ſeen darting in a zig-zag direction, through the column of ſmoke and aſhes; and this lightning is ſometimes attended with thunder. But from ſome obſervations which have been made, this thunder and lightning are ſeemingly leſs intenſe than atmoſpheric electricity. When theſe terrible appearances have continued for four or five months, or for a longer or ſhorter time, according to the nature of the eruption, the lava begins to flow. This is a current of melted matter, which ſometimes boils over the top, and ſometimes, when the mountain is high, as is the caſe with Ætna, burſts out at the ſide, and makes a paſſage for itſelf. The period of the duration of the eruption is very different. Sometimes it continues to flow, at intervals, for the ſpace of ſeveral weeks.

240 Matters thrown out of volcanoes.

The matters ejected from volcanoes are lavas, which are either more or leſs conſolidated; aſhes, flags of different kinds, and ſtones which have undergone little or no fuſion. For an account of the nature and properties of volcanic productions, ſee MINERALOGY. Stones have been projected into the air from Mount Ætna, to the height of 7000 feet. A ſtone which was ejected from Veſuvius, meaſured 12 feet long, and 45 feet in circumference; and even larger maſſes have been thrown out from Ætna.

Water has been frequently ejected from volcanoes. This

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This water is ſometimes cold, and ſometimes hot. Eruptions of water have taken place, both from Veſuvius and Ætna. At one time ſalt water was ejected from Mount Veſuvius. Different opinions have been held concerning the origin of this water, or its connexion with the volcano. This is founded on the circumſtance already taken notice of in the general remark which was made, that almoſt all volcanoes are in the vicinity of the ſea.

It ſeems to be a ſingular circumſtance in the hiſtory of volcanoes, that when once eruptions have commenced, they follow each other in rapid ſucceſſion; and at other times that they ceaſe for a long period. From the year 1447, Ætna ceaſed to throw out any fire till the year 1536, when a terrible eruption took place, accompanied with ſmoke, flame, aſhes, and burning ſtones. This conflagration continued to rage with great violence for many weeks. The following year a river ſwelled and overflowed its banks to a great diſtance; furious ſqualls of wind ſucceeded, after which there was a terrible eruption from Ætna. The torrents of flaming and fuſed matter which flowed out, deſtroyed towns, villages, and vineyards, to a great extent. After the conflagration, the ſummit of the mountain fell in with a dreadful craſh. For 100 years after this period, the eruptions ſeemed to obſerve ſome kind of regularity, returning periodically every 25 and 30 years. From the year 1686 to 1755, the ſame year on which the earthquake at Liſbon happened, for more than half a century, Ætna enjoyed profound repoſe.

The firſt conſiderable eruption of Veſuvius, the account of which is recorded in hiſtory, happened in the year 79 of the Chriſtian era. It was this eruption which deſtroyed Herculaneum and Pompeii; but this was not the firſt eruption of this mountain, for the ſtreets of theſe cities have been ſince diſcovered to be paved with lava. Since that time, 30 different eruptions have taken place. There was a very remarkable one in 1538.

241 Volcanoes become extinct, and are rekindled.

It would appear that volcanoes ſeem to become quite extinct, and are rekindled. Some of the Roman writers, as Diodorus Siculus, Vitruvius, and others, ſpeak of Veſuvius only as having been a volcano. After this period it burnt for 1000 years, and again became extinct, from 1136 to 1506. Pools of water had collected in the crater, and woods were growing on its ſides, and even in the crater itſelf. Veſuvius has now burnt for three centuries paſt, as furiouſly as ever; but particularly, during the 18th century. Of 29 eruptions which have taken place from Veſuvius, ſince the reign of Titus, half of the number have happened in the 18th century.

Beſide the volcanoes, the hiſtory of which we have now briefly detailed, volcanoes are known to exiſt at the bottom of the ocean. Theſe are diſtinguiſhed by

242 Submarine volcanoes.

the name of *ſubmarine volcanoes*. Excepting in ſituation, ſo far as the hiſtory of ſubmarine volcanoes is known, they reſemble the volcanoes on land. It would appear that they exiſt in the tops of mountains at the bottom of the ocean, and eject immenſe burning maſſes of matter in whirlwinds of aſhes and pumice, with prodigious torrents of lava. Submarine volcanoes are either very few in number, or the places where they exiſt have not been aſcertained. Thoſe that are certainly known are at Santorin, the Azores, and Iceland. The iſland of Santorin, formerly called Thera and St Irene, was denominated by the Greeks, in alluſion to its origin, Καμιναι, or "burnt." According to Pliny, there is a tradition, that it aroſe out of the ſea, at a very remote but unknown period.

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Without going far back into hiſtory, to inquire concerning the early eruptions of this volcano, we ſhall mention ſome of a later date, the exiſtence of which is better aſcertained. In 1457, an eruption took place, at which time aſhes and red-hot rocks were ejected, with a great quantity of lava. This event, with the date of it, is recorded on a marble ſtone, erected near the gate of Fort Scarus, in Santorin. An eruption alſo took place in 1570. This produced a new iſland, called the *Little Kaminoi*. In 1650, the agitations of the volcanoes continued for the greater part of a year. Smyrna and Conſtantinople were incommoded with the aſhes, which ruſhed from the ocean in whirlwinds of flame. The ſame volcano opened again in 1707. The Little Kaminoi, mentioned, was increaſed, and it is now more than three leagues in circumference. A violent eruption took place in 1767, which ſhook the earth greatly for ſome days, and raiſed the ſea in ſuch a manner, as to excite apprehenſions of the deſtruction of the iſlands in the neighbourhood. A thick black ſmoke darkened the air, which was ſo infected with a ſtrong ſmell of ſulphur, that many perſons and animals were ſuffocated by it. Black aſhes reſembling gunpowder were diſperſed around, and torrents of flame iſſuing from the ſea, and waving above it, to the height of ſeveral feet, lighted, at intervals, the horrid ſcene. At the end of 10 or 12 days the eruption began to be more moderate; and a new iſland which had been thrown up was diſcovered. When it was examined, many parts of it were ſtill burning; but the next day, thoſe whom curioſity had drawn to the ſpot, were compelled to betake themſelves to flight. They felt the new ſoil moving; in ſome parts it roſe, and ſunk in others. The earth, ſea, and ſky, ſoon reſumed their formidable appearance; the boiling ſea changed colour; flames in rapid ſucceſſion iſſued as from a furnace, but accompanied with aſhes and pumice. The frightful noiſe of ſubterranean thunders was heard; it ſeemed as if enormous rocks, darting from the bottom of the abyſs, beat againſt the vaults above it, and were alternately repelled and thrown up again. The repetition of their blows ſeemed to be diſtinctly heard. Some of them finding a paſſage, were ſeen flying up red hot into the air, and again falling into the ſea from which they had been ejected. Maſſes were produced, held together for ſome days, and then diſappeared. In this general diſorder, large portions of the Little Kaminoi were ſwallowed up. Meanwhile the labour of the volcano took a larger ſurface. Its ejections became prodigiouſly abundant, and a new iſland was ſeen forming. By ſucceſſive additions continued for near four months, it made a junction with that produced in June. From the colour of its ſoil it was named the *Black Iſland*. It is larger than the Little Kaminoi, and is ſeparated from it by a narrow ſtrait. After frequent alarms for ſeveral months, the volcano opened again on the 15th of April in the following year; but the eruption was only for a moment, when it threw out a multitude of burning rocks, which fell at the diſtance of two miles.

Similar

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Similar ſubmarine volcanoes have been obſerved near the iſland of St Michael, one of the Azores or Weſtern iſlands in the Atlantic ocean. In the year 1638, near the iſland of St Michael, where the ſea was known to be 120 feet deep, there aroſe, after an agitation of ſeveral weeks, an iſland about ſix miles round. It was again ſwallowed up in about the ſame ſpace of time that had elapſed during its formation. In the year 1691, this volcano was in great agitation for a month. It convulſed the whole iſland of St Michael, and by the heat and violent commotion of the ſea, as well as by the eruption of flames, aſhes, and pumice, occaſioned great damage; but in this caſe no iſland appeared. Similar eruptions were known in 1720, and in 1757. During the latter eruption, ſome of the iſlands were ſhaken to their foundations.

After this account of ſubmarine volcanoes, of their effects, and of the iſlands formed by them, it would be unneceſſary to enter into any detail of the ſubmarine volcano which threw up an iſland off the coaſt of Iceland, in the year 1783. This iſland, the exiſtence of which ſeemed to be fully aſcertained, was again ſwallowed up in the ocean, and was ſeen no more.

243 Mud volcanoes.

Volcanoes of a very different kind have been deſcribed. The volcanoes to which we allude, have received the name of *mud volcanoes*, from ejecting a great quantity of mud. Theſe, however, are ſimilar to thoſe which have been already deſcribed, in having volcanic motions and convulſive eruptions. The firſt volcano of this kind which was diſcovered is in the iſland of Sicily, near a place called Maccalouba, between Arragona and Girgenti. It is in a hill of a conical ſhape, truncated at the top, and 150 feet high. The ſummit is a plain, half a mile round, and the whole ſurface is covered with thick mud. The depth of the mud, which is ſuppoſed to be immenſe, is unknown. There is not the ſlighteſt appearance of vegetation upon it. In the rainy ſeaſon the mud is much ſoftened; the ſurface is even, and there is a general ebullition over it, which is accompanied with a very ſenſible rumbling noiſe. In the dry ſeaſon, the mud acquires greater conſiſtency, but without ceaſing its motion. The plain aſſumes a form ſomewhat convex; a number of little cones are thrown up, which rarely riſe to the height of two feet. Each of them has a crater, where a black mud is ſeen in conſtant agitation, and inceſſantly emitting bubbles of air. With theſe the latter inſenſibly riſes, and as ſoon as the crater is full of it, it diſgorges. The reſidue ſinks, and the cone has a free crater until a new emiſſion.

This hill is ſometimes ſubject to alarming convulſions. Earthquakes are felt at the diſtance of two or three miles, accompanied with internal noiſes, reſembling thunder. Theſe increaſe for ſeveral days, and terminate in an eruption of a prodigious ſpout of mud, earth, and ſtones, which riſes two or three hundred feet into the air. This exploſion is repeated twice or thrice in the courſe of 24 hours. Some years paſs over without any eruption, but it generally happens that the eruptions continue yearly for five years ſucceſſively. An eruption from this mud volcano took place in 1777.

Phenomena ſomewhat ſimilar have been deſcribed by Pallas, which he obſerved partly in the peninſula of the Kercha, the boundary of Europe to the ſouth-eaſt of Little Tartary, now Taurida, and partly in the iſland of Taman, which is ſeparated from Kercha only by one of the mouths of the river Cuban. The iſland of Taman is ſituated in Aſia. Theſe places, he obſerves, are in flat countries where there are few hills, and thoſe very little raiſed above the level of the ſea. The whole is covered with beds of ſlime, mixed with ſand, with ſome beds of marl and ſea-ſhells. From this he concludes that no real volanic pit can exiſt here. Copious ſprings of petroleum are found in ſeveral places, and alſo pools or ſyphons of various dimenſions, through moſt of which a briny mud is diſgorged in bubbles. Pallas obſerved ſeveral of theſe pools, both in the peninſula and in Taman. The laſt eruption which took place, he obſerves, was in 1794. This was the greateſt and moſt copious that had been known. It proceeded from the top of a hill at the north point of Taman. The place where the new gulf opened was a pool, where the ſnow and rain water uſually remained for a long time. The exploſion came on with a noiſe like that of thunder, and with the appearance of a maſs of fire in the form of a ſheaf. This laſted only for about half an hour, and it was accompanied with a thick ſmoke; but the ebullition which threw up part of the liquid mud, continued till the next day, after which the mud ran ſlowly in ſtreams down the hill. The mud diſcharged was of a ſoft clay, of a bluiſh aſh colour, every where of the ſame nature, and mixed with brilliant ſparks of mica, with a ſmall quantity of marl, calcareous and ſandy fragments of ſchiſtus, which ſeemed to have been torn from their beds.

Pallas ſuppoſes that a very deep coal mine had been for ages on fire, under Kercha and Taman, and that the ſea having accidentally broken into the burning cavities of the mine, the expanſion produced by the water converted into ſteam, and the ſtruggle of the different aeriform ſubſtances to get free, forced the upper beds, broke them in pieces, and formed a paſſage to themſelves. The vapours, as they eſcaped, carried the mud along with them. But others have ſuppoſed that theſe phenomena are not produced by fire; that the appearance of the ſheaf of fire muſt have been extraneous, or, that it was only a quantity of inflammable air, which exploded when it came to the ſurface; or, perhaps it was altogether an illuſion, from the appearances of the vapours which were emitted.

An account is given of a ſingular phenomenon, ſomewhat ſimilar to the above, which was obſerved in 1711, at Boſely, near Wenlock, in Shropſhire. After a great hurricane, the inhabitants were awakened in the middle of the night by commotions of the earth, which were accompanied with noiſe. Some perſons went to an eminence from which the noiſe proceeded, and they ſaw water oozing through the turf, while at the ſame time inflammable air was emitted. The water was not hot. This continued for ſome time, but at laſt it ceaſed to throw out any inflammable air for ſome years, previous to the year 1746, when a ſecond eruption took place, attended with ſimilar circumſtances.

We ſhall not dwell longer on the hiſtory of volcanoes. For a particular account of the moſt remarkable eruptions of the principal volcanoes in the world, the reader is referred to the hiſtory given under ÆTNA, HECLA, and VESUVIUS. We ſhall now proceed to ſtate ſome of the opinions and conjectures of philoſophers,

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phers, with regard to the cauſe of theſe extraordinary phenomena.

244 Cauſes of volcanoes.

Volcanic eruptions have been aſcribed to the action of the waters of the ſea, burſting in upon an immenſe quantity of fuſed or burning matter; to the action of central fires, and to the decompoſition of different ſubſtances, by which a great quantity of heat and inflammable ſubſtances is produced.

Water, according to ſome philoſophers, is abſolutely neceſſary for the formation of volcanoes. This opinion is ſupported by the circumſtance of almoſt all volcanoes being near the ſea. According to this opinion, they were all formed under the ſurface of the waters of the ocean. The firſt exploſion at the formation of a volcano, it is ſuppoſed, was preceded by an earthquake. The firſt eruptions would be extremely violent, and immenſe quantities of matter would be ejected. Torrents of lava would continue to be diſcharged for a long ſeries of ages, and thus the foundations of the burning mountain are laid in the bottom of the ocean. But it becomes a queſtion, in what way the internal fire was preſerved from extinction by the incumbent waters of the ocean? To this M. Houel replies, that the fire having diſpoſed the ſubſtances in fuſion to make an eruption, next laid open the earth, and emitted as much matter as it could diſcharge, with a force ſufficient to overcome the reſiſtance of the column of water, which would oppoſe its aſcent; but as the ſtrength of the fire diminiſhed, the matter diſcharged was no longer expelled beyond the mouth; but, by accumulating there, ſoon cloſed up the orifice. Thus, only ſmall orifices would be left ſufficient for giving vent to the vapours of the volcano, and from which only ſmall bubbles of air could aſcend to the ſurface of the water, until new circumſtances, ſuch as originally gave occaſion to the eruption of the volcano, again took place in the bowels of the earth, and produced new eruptions, either through the ſame or other mouths. The appearance of the ſea over the new formed volcano, in its ſtate of tranquillity, would then be ſimilar to what it is betwixt the iſlands of Baſilizzo and Pariaria. Columns of air bubbles are there aſcending at the depth of more than 30 feet, and burſt on their arriving at the ſurface. This air would continue to diſengage itſelf with little diſturbance as long as it iſſues forth only in ſmall quantity, until, at the very inſtant of exploſion, when prodigious quantities, generated in the burning focus, would make their way at once, and the ſame phenomena which originally took place would again make their appearance."

A volcano, while under water, cannot act preciſely as it does in the open air. Its eruptions, though equally ſtrong, cannot extend to ſo great a diſtance. The lava accumulates in greater quantity round the crater; the ſand, aſhes, and pozzolana are not carried away by the winds, but are depoſited around its edges, and prevent the marine ſubſtances which are driven that way by the waters from entering. Thus they agglomerate with theſe bodies, and thus a pyramidal mount is formed of all the materials together.

In this manner M. Houel ſuppoſes that the mountain was gradually raiſed out of the ſea by the accumulation of lava, &c. at every eruption, and that the cavern of the volcano was gradually enlarged, the lava being driven down into the bottom of the cavern by the continued action of the ſtones which the volcano is conſtantly throwing up; that it was there fuſed, and at laſt thrown out at the top of the mountain to accumulate on its ſides. M. Houel's opinion about the volcanic fire we ſhall give in his own words.

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"We cannot form any idea of fire ſubſiſting alone, without any pabulum, and unconnected with any other principle. We never behold it but in conjunction with ſome other body, which nouriſhes and is conſumed by it. The matter in fuſion, which iſſues from the focus, is but the incombuſtible part of that which nouriſhes the fire, and into the boſom of which that active principle penetrates in ſearch of pabulum. But as the fire acts only in proportion to the facility with which it can diſſolve and evaporate, I am of opinion, that it is only the bottom of the volcano on which it acts; and that its action extends no farther than to keep theſe ſubſtances which it has melted in a conſtant ſtate of ebullition. That fuſible matter being diſcharged from the mouth of the volcano, and hardening as it is gradually cooled by the action of the air, produces that ſpecies of ſtones which are diſtinguiſhed by the name of *lavas*. This lava, even when in the focus, and in a ſtate of fluidity, muſt alſo poſſeſs a certain degree of ſolidity, on account of the gravity and denſity of its particles. It therefore oppoſes the fire with a degree of reſiſtance which irritates it, and requires, to put it into a ſtate of ebullition, a power proportioned to the bulk of the maſs.

"That quantity of matter, when diſſolved by the action of the fire, muſt conſtantly reſemble any other thick ſubſtance in a ſtate of ebullition. Small exploſions are produced in various parts over the ſurface of every ſuch ſubſtance while in a ſtate of ebullition; and, by the burſting of theſe bubbles, a great number of ſmall particles are ſcattered around. This is the very proceſs carried on in the focus of a volcano, though on a ſcale immenſely more large; and the vaſt exploſions there produced expel every body which lies in their way with the utmoſt violence; nor is there any piece of lava which falls down from the upper part of the arch, of weight ſufficient to reſiſt this violent centrifugal force.

"The pabulum by which the internal fire is ſupported, M. Houel thinks to be ſubſtances contained in the mountain itſelf, together with bitumen, ſulphur, and other inflammable materials, which may from time to time flow into the focus of the volcano in a melted ſtate through the ſubterraneous ducts, and the exploſions he aſcribes to water making its way in the ſame manner. The water is converted into ſteam, which fills the cavern and puſhes the melted lava out at the crater; this opinion is corroborated by the copious ſmoke which always precedes an eruption. But, combined with the water, there is always a quantity of other ſubſtances, whoſe effects precede, accompany, or follow the eruptions, and produce all the various phenomena which they diſplay. The eruption of water from Ætna in the year 1775 proceeded undoubtedly from this cauſe. The ſea, or ſome of the reſervoirs in Ætna or the adjacent mountains, by ſome means diſcharged a vaſt quantity of water into the focus of the volcano. That water was inſtantly reſolved into vapour, which filled the whole crater, and iſſued from the mouth of the crater. As ſoon as it made its way into the open atmoſphere, it was condenſed again into water, which ſtreamed down the

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the ſides of the mountain in a dreadful and deſtructive torrent."

Others have attempted to account for the exiſtence of volcanic fire, on the ſuppoſition that it is derived from central fires, and to theſe it is ſuppoſed that volcanoes act the part of chimneys; while others are of opinion that they are owing to the chemical decompoſition of different ſubſtances, by which inflammable matters are evolved, with a great deal of heat, and by means of the latter the combuſtible materials are kindled, and exhibit the phenomena which are thus propoſed to be accounted for.

M. Patrin is one of the lateſt naturaliſts who, with the aſſiſtance of modern chemiſtry, has attempted to account for the phenomena of volcanoes on the principles of this ſcience. For a full view of his theory, or rather of his fanciful conjectures on this ſubject, we muſt refer the reader to the work itſelf *. But the following is a recapitulation of the principles on which he gives this explanation. All volcanoes, he obſerves, in a ſtate of activity, are in the vicinity of the ſea, and are never found but in thoſe places where ſea ſalt is abundant. The volcanoes of the Mediterranean abſtract the ſalt which the waters of the ocean hold in ſolution, and are conſtantly pouring in by the ſtraits of Gibraltar. The ſtrata of primitive ſchiſtus are the great laboratories in which volcanic matters are prepared, by a conſtant circulation of different fluids; but according to this theory, theſe ſtrata contribute no part of their own ſubſtance. They ſuffer no waſte in the proceſs.

* *Hiſt. Nat. de Miner.* tom. v.

The ſphere of the activity of volcanoes may be far extended in theſe ſtrata, but they have no other outlet beſide ſpiracles, by which the gaſeous ſubſtances eſcape, of which one part is diſſipated in the atmoſphere, and the other becomes concrete by its combination with oxygen. The concretion of theſe fluids is ſuppoſed to be analogous to the concretion of the primitive matters of the globe, according to the theory of La Place; and the elective attractions determine, in the ſame way, the formation of ſtony cryſtals.

Volcanic eruptions are proportioned, in regard to their violence and duration, to the extent of the ſtrata of ſchiſtus in which the volcanic fluids are accumulated. Theſe fluids are,

1. *Muriatic acid*, which carries off the oxygen from the metallic oxides of the ſchiſtus.

2. *The oxygen of the atmoſphere*, which conſtantly replaces in the metals that which was carried off by the muriatic acid.

3. *Carbonic acid gas*, which the water abſorbs from the atmoſphere, and conveys to the ſchiſtus, which always abounds in carbone.

4. *Hydrogen*, which proceeds from the decompoſition of water. A part of this hydrogen is inflamed by electric exploſions; the other united to carbonic acid forms oil, which becomes petroleum by its combination with ſulphuric acid; and it is to this petroleum that the bitterneſs of ſea water is owing.

5. *The electric fluid*, which is attracted from the atmoſphere by the metals contained in the ſchiſtus. Sulphur ſeems to be the moſt homogeneous portion of this fluid, which has become concrete. Phoſphorus is a modification of it, and it contributes to the fixation of oxygen. The ſulphur formed in the ſchiſtus by means of the electric fluid, combines with the oxygen, and forms ſulphuric acid, which decompoſes the ſea ſalt.

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6. *The metalliferous fluid.* This forms the iron in lavas. It is the origin of metallic veins, and the colouring principle of organized bodies. This ſubſtance in its undecompoſed ſtate affords iron, but by decompoſition it produces other metals. It is conjectured to be one of the principles of muriatic acid, and it contributes, along with phoſphorus, to fix oxygen under an earthy form.

7. The laſt of the volcanic fluids is *azotic gas*. To this gas is owing the formation of the maſſes of carbonate of lime which are ejected by Veſuvius, and of the calcareous earth contained in lavas.

Such are the materials with which the author propoſes to form the different ſubſtances which are produced in volcanoes, and by the operation of which he propoſes to explain the phenomena of volcanic eruptions. Our readers will probably agree with us in thinking, that the preſent ſtate of chemical ſcience, even with the aſſiſtance of ſuch hypothetical ſubſtances as the metalliferous fluids, is yet inadequate to give any degree of ſupport to ſuch opinions, even in the form of conjecture. We ſhall therefore diſmiſs it without farther remark.

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We ſhall now conclude this ſubject with ſome intereſting obſervations by M. de Luc, on the nature of the ſtrata in which volcanic fires exiſt.

"Volcanoes, he obſerves, have been more numerous on the ſurface of our continents, when they were under the waters of the ancient ſea; and as this claſs of mountains, raiſed by ſubterranean fires, manifeſt themſelves ſtill on the ſhores of the preſent ſea, and in the middle of its waters, it is of importance to geology and the philoſophy of the earth to obtain as juſt ideas of them as poſſible.

"I have attended a great deal to this ſubject from my own obſervations; and I have ſhown, at different times, the errors into which ſeveral geologiſts and naturaliſts, in treating of it, have fallen.

"This claſs of mountains, in particular, requires that we ſhould ſee them, that we ſhould behold them during their eruptions, that we ſhould have traced the progreſs of their lava, and have obſerved cloſely their exploſions; that we ſhould have made a numerous collection of the matters which they throw up under their different circumſtances, that we might afterwards be able to ſtudy them in the cabinet, and to judge of their compoſition according to the phenomena which have been obſerved on the ſpot.

"This ſtudy is highly neceſſary when we apply it to geology and the philoſophy of the earth, in order that we may avoid falling into thoſe miſtakes which make us aſcribe to ſubterranean fires what does not belong to them, or which leads us to refuſe them what really belongs to them.

"We read in the *Journal de Phyſique* for January 1804, under the title, *On the Cauſe of Volcanoes*, the following aſſertions:

'What is the nature of the matters which maintain theſe ſubterranean fires? We have ſeen that Chimboraço, all theſe enormous volcanoes of Peru, and the Peak of Teneriffe, are compoſed of porphyry.

'The Puy-de-Dôme is alſo compoſed of porphyry, as well as the Mont d'Or and the Cantal.

'Ætna,

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'Ætna, Solfatara, and Vesuvius, are also of the porphyry kind.

'These facts prove that the most considerable volcanoes with which we are acquainted are of porphyry.'

"This opinion, that the fires of volcanoes have their centres in such or such a rock, and that their lavas are produced from these rocks, has always appeared to me not to be founded on any certain data. Opinions also on this subject have varied; some having placed the origin of lava in horn rock, others in granite or schist, and at present it is assigned to porphyry.

"I have always been of opinion that nothing certain could be determined in regard to this point. It ever remains uncertain whether the seat of the matters of which lava is formed be in compact rocks, or in strata in the state of softness, pulverulent, and muddy.

"Those who see lava issue from a volcano in its state of fusion and incandescence, and in its cooling, are convinced that the nature of every thing is changed, that it exhibits a paste in which nothing can be known, except the substances which the volcanic fires have not reduced to fusion.

"But these substances contained in the paste of lava, and those which are the most numerous, show us, that the strata from which they proceed cannot be similar to those exposed to the view, nor even to the most profound strata to which we can penetrate.

"Admitting the hypothesis, that the strata from which the lavas proceed are in a pulverulent and muddy state, containing elements of all these small crystals, one may conceive how they are formed there, insulated, grouped, or solitary, and are found then in the lava in that state of insolution.

"The fragments of natural rocks thrown up by Vesuvius are not of the same kind as the matters of which the lava is composed. Most of these fragments are micaceous rocks, with laminæ of greater or less size, and of a kind of granite called *syenite*. I have found some composed of white quartzy rock; it is found sometimes of calcareous rock.

"The most probable idea that can be formed in regard to the origin of these fragments is, that they have been carried from the borders of the strata through which the lava, that comes from great depths, has opened for itself a passage. These fragments are carried to the surface of the lava as far as the bottom of the chimney of the crater, whence they have been thrown out by explosions, mixed with fragments separated, or rather torn, from the lava; for it is not by the lava that they have been brought forth to view, but by explosions.

"Some of these fragments of natural rocks have not been attacked by the fire; others have more or less; which depends, no doubt, on the place which they occupied in the volcano, and on the time which they remained in it. The most of the latter have retained at their surface a crust of lava, and this crust contains substances which are not the same as that of the fragment it covers.

"On Vesuvius the strata pierced by eruptions are lower than the surface of the soil; in Auvergne and several places of Germany they are above; for this reason there are seen there in their place schists or granites, which the eruptions have broken to form for themselves a passage. Earthquakes and Volcanoes.

"No volcano rests on natural strata: they sometimes show themselves on the exterior; but they have been opened by eruptions, and their edges have remained in their place.

"The focus of no volcano exists or has existed in the cone which appears above the surface of the ground. They have been raised by eruptions, which, proceeding from great depths, have thrown them up through the upper strata. When it is said, therefore, that the volcanic mountains of Auvergne rest on granite, this is a mistake, and an incorrect expression has been used by those who have not formed a just idea of the phenomenon. Lava may have flowed upon granite or any other rock, and rested upon it; but this is never the case with the volcano itself: its bases are below all the rocks visible.

"It is from the bosom even of the lava, when in a state of fusion in the interior of the volcano, that all the explosions proceed. In that state of fusion they contain all the matters which produce fermentations, and the disengagement of expansible fluids.

"I have been enabled to ascertain this on Vesuvius as far as was possible. The continual noise which was heard through the two interior mouths of the crater which I had before my eyes, was that of an ebullition, accompanied with inflammable vapours, and the gerbes of burning matters which they threw up at intervals were separated pieces of the lava in its state of fusion. I saw several of them in the air change their form, and sometimes become flat on the bodies which they struck or embraced in falling. And among the most apparent of these fragments there are always a multitude of small ones of the size of peas and nuts, and still smaller ones, which show at their surface, by their asperities, all the characters of laceration.

"The name of *scoriæ* has been given to these fragments, to distinguish them from compact lava, though their composition be the same as that of the hardest lava; and it is for want of reflecting properly on this point that it has been said that it is the compact part only that we must observe, in order to judge of their nature. The pieces which I took from the flowing lava with an iron hook, have at their surface the same lacerations and the same asperities as the fragments thrown up by explosions, and both contain the same substances.

"This separation, by tearing off the parcels of the lava, effected by fermentations and explosions which proceed from their bosom, serves to explain those columns, sometimes prodigious, of volcanic sand, which rise from the principal crater. When seen with a magnifying glass, this sand exhibits nothing but lava reduced very small, the particles of which, rough with inequalities, have the bright black colour and the varnish of recent lava.

"Parcels of substances which exist in our strata, such as fragments of quartz, scales of mica, and crystals of feldspar, are found sometimes in lava. Similar matters must no doubt be disseminated in the composition of our globe, without there being reason to conclude that the strata from which they proceed are the same as the exterior strata. It is neither in the granites, the porphyries,

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ries, nor the horn rock, and ſtill leſs in the ſchiſts and calcareous rocks, that the ſchorls of volcanoes, the leucites, and perhaps olivins, will be found. Theſe ſmall cryſtals are brought to view by the lava, otherwiſe they would be unknown to us.

"Theſe lavas contain a great deal of iron, which they acquire neither from the granite nor porphyries. Might not one ſee in the ferruginous ſand which is found in abundance on the borders of the ſea near Naples, and in the environs of Rome, ſpecimens of that kind of pulverulent ſtrata from which lava proceeds?

"I have here offered enough to prove that it cannot be determined that lava proceeds from ſtrata ſimilar to thoſe with which we are acquainted. The operations of volcanoes, thoſe vaſt laboratories of nature, will always remain unknown to us, and on this ſubject our conjectures will always be very uncertain.

"What is the nature of that mixture which gives birth to theſe eruptions, that produce lava and throw up mountains? What we obſerve as certain is, that the introduction of the water of the ſea is neceſſary to excite theſe fermentations, as containing marine acid, and other ſalts, which, united to the ſulphuric acid, the baſes of which are contained in abundance in the ſubterranean ſtrata, determine theſe fermentations, which produce the diſengagement of fire and other fluids, and all the grand effects that are the conſequence.

"Several naturaliſts have believed, and ſtill believe, that freſh or rain water is ſufficient for this purpoſe; but they are miſtaken: this opinion is contradicted by every fact known. To be convinced of this, nothing is neceſſary but to take a ſhort view of them. I have done it ſeveral times, as it is neceſſary to conſider them often. I ſhall here enumerate the principal ones:—No burning mountain exiſts in the interior part of the earth; and all thoſe which ſtill burn are, without exception, in the neighbourhood of the ſea, or ſurrounded by its waters. Among the deliqueſcent ſalts depoſited by the ſmoke of volcanoes, we diſtinguiſh chiefly the marine ſalt, united to different baſes. Several of the volcanoes of Iceland, and Hecla itſelf, ſometimes throw up eruptions of water, which depoſit marine ſalt in abundance. No extent of freſh water, however vaſt, gives birth to a volcano. Theſe facts are ſufficient to prove that the concurrence of ſea-water is abſolutely neceſſary to excite thoſe fermentations which produce volcanoes.

"I ſhall here repeat the diſtinction I have already made between burnt-out volcanoes and the ancient volcanoes, that I may range them in two ſeparate claſſes.

"When we ſimply give the name of *burnt-out* or *extinguiſhed* volcanoes to volcanic mountains which are in the middle of the continents, it is to repreſent them as having burnt while the land was dry, and inhabited as it is at preſent; which is not a juſt idea. Theſe volcanoes have burnt when the land on which they are raiſed was under the waters of the ancient ſea, and none of them have burnt ſince our continents became dry. It is even very apparent that moſt of them were extinct before the retreat of the ſea, as we find by numerous examples in the preſent ſea.

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"Thoſe which I denominate extinct volcanoes are ſuch as no longer burn, though ſurrounded by the ſea, or placed on the borders of it. They would ſtill burn, were not the inflammable matters by which they were raiſed really exhauſted and conſumed. Of this kind is the volcano of Agde, in Languedoc. Of this kind alſo are many of the volcanic iſlands which have not thrown up fire ſince time immemorial.

"M. Humboldt, in his letters written from Peru, ſpeaks of the volcanoes which he viſited, but what he ſays is not ſufficiently preciſe to enable us to form a juſt idea of them. He repreſents Chimboraço as being compoſed of porphyry from its bottom to its ſummit, and adds, that the porphyry is 1900 toiſes in thickneſs; afterwards, he remarks, that it is almoſt improbable that Chimboraço, as well as Pichincha and Antiſana, ſhould be of a volcanic nature: 'The place by which we aſcended, (ſays he), is compoſed of burnt and ſcorified rock, mixed with pumiceſtone, which reſembles all the currents of lava in this country.'

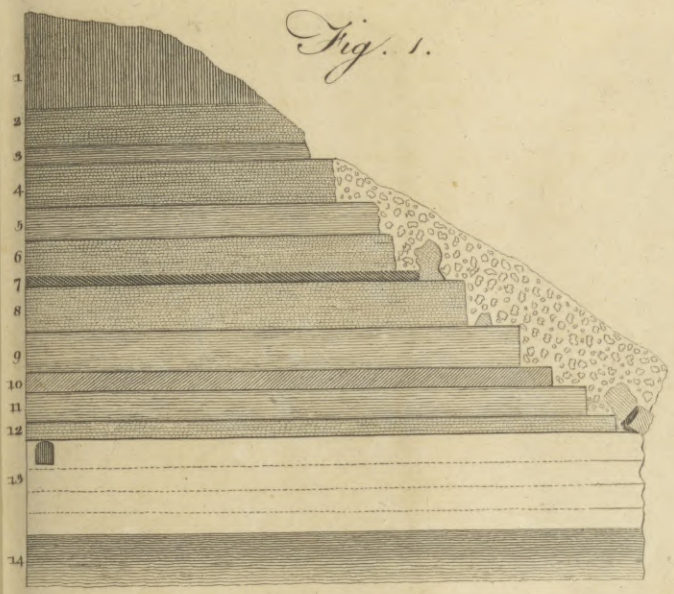
"Here are two characters very different. If Chimboraço be porphyry from the top to the bottom, it is not compoſed of burnt and ſcorified rocks, mixed with pumiceſtone; and if it be compoſed of burnt rocks, it cannot be porphyry. This expreſſion, *burnt and ſcorified rocks*, is not even exact, becauſe it excites the idea of natural rocks, altered in their place by fire, and they are certainly lava which has been thrown up by the volcano. But the truth muſt be, that Chimboraço, and all the other volcanoes of Peru, are compoſed of volcanic matters, from their baſe at the level of the ſea to the ſummit.

"I have juſt read in the *Annales du Muſéum d'Hiſtoire Naturelle**, a letter of the ſame traveller, written from Mexico, on his return from Peru, where, ſpeaking of the volcanoes of Popayan, Paſto, Quito, and the other parts of the Andes, he ſays, 'Great maſſes of this foſſil (*obſidian*) have iſſued from the craters; and the ſides of theſe gulfs, which we cloſely examined, conſiſt of porphyry, the baſe of which holds a mean between obſidian and pitchſtone (*pechſtein*).' M. Humboldt therefore conſiders obſidian, or black compact glaſs, as a natural foſſil or rock, and not as volcanic glaſs †."

* N° xvii.

† *Journ. des Mines*, N° 95.

Fig. 1.



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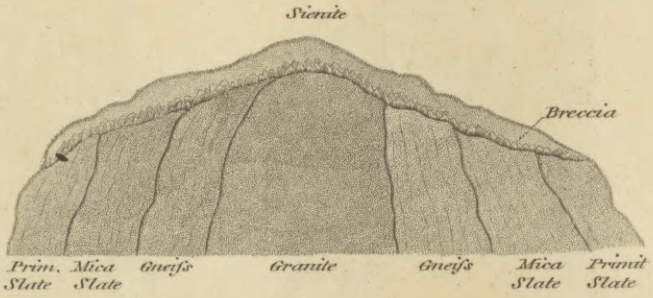

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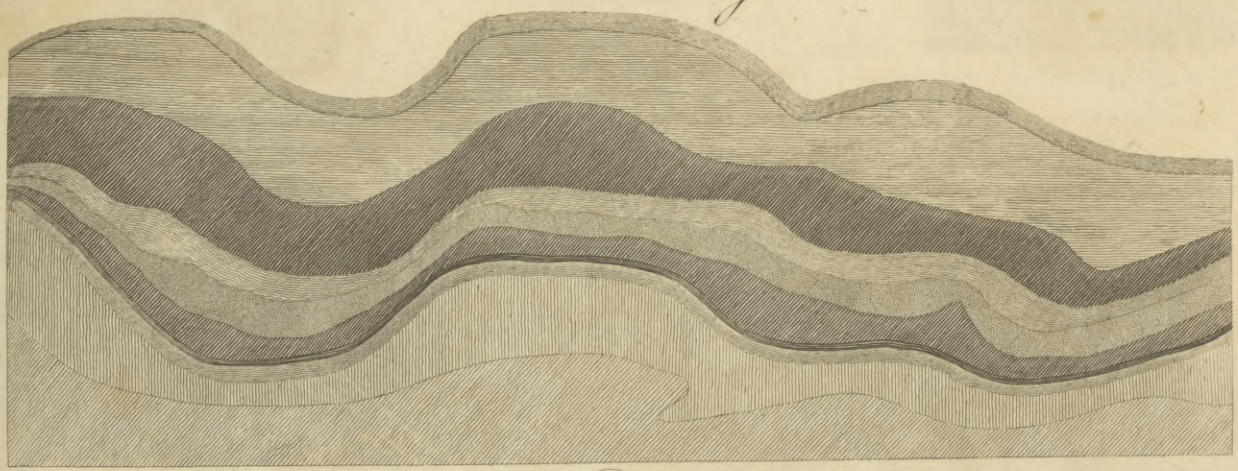

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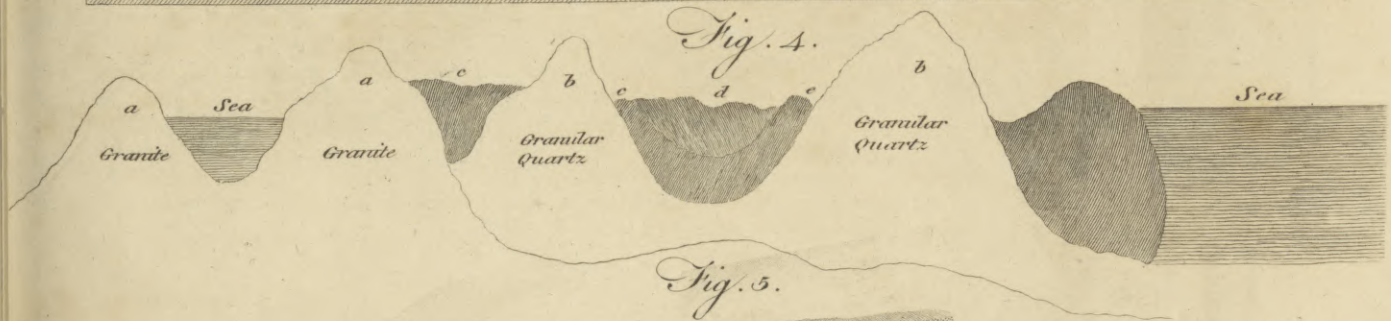

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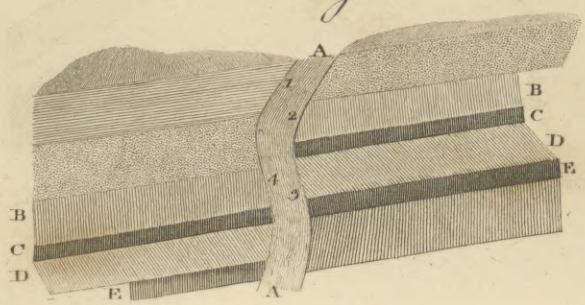
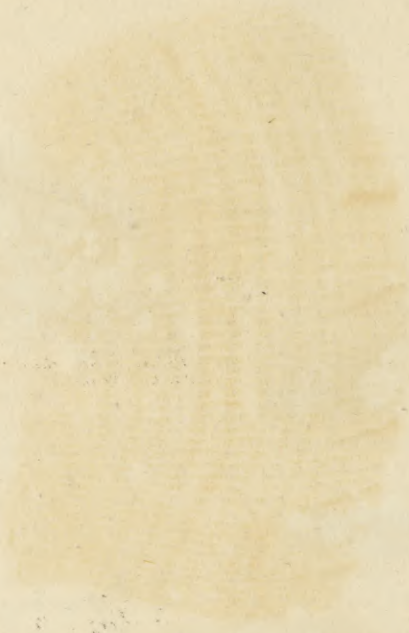


W. Archibald Sculp.



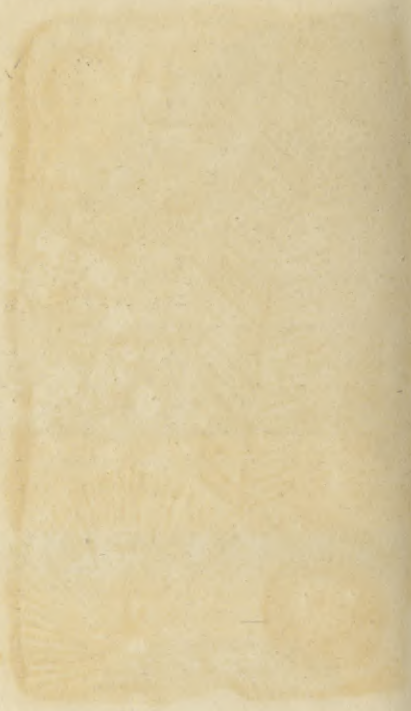


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Fig. 7.

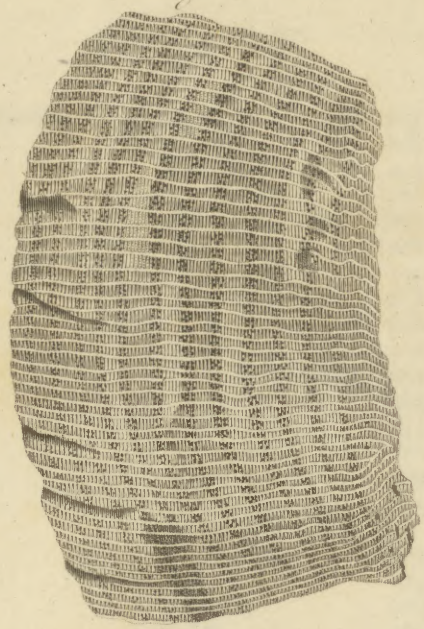

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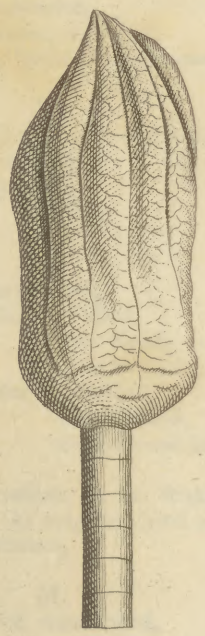
Fig. 10.

Fig. 9.



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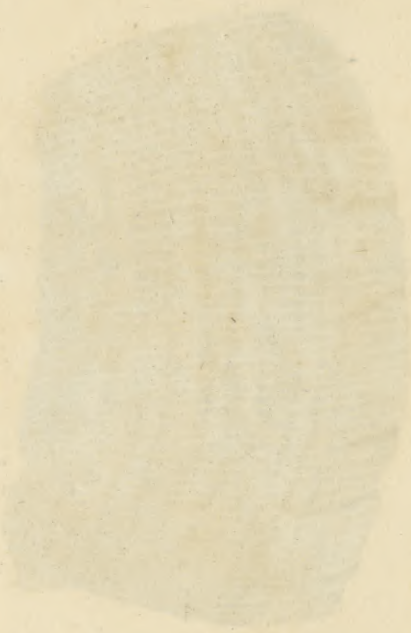

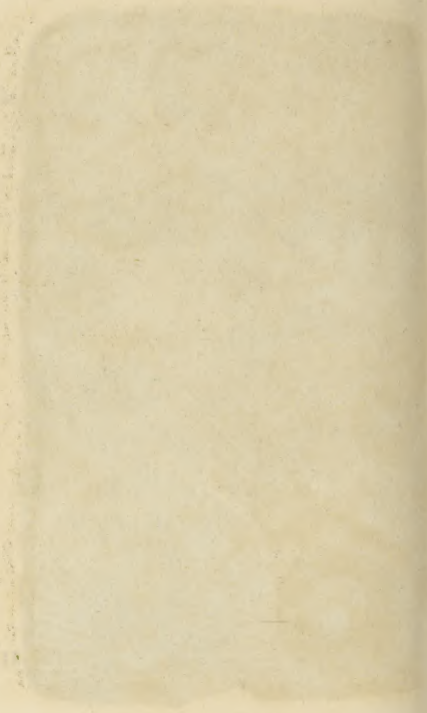

INDEX.

Geomancy. GEOMANCY, GEOMANTIA, a kind of divination, performed by means of a number of little points, or dots, made on paper at random: and conſidering the various lines and figures which thoſe points preſent; and thence forming a pretended judgment of futurity, and deciding any queſtion propoſed.

The word is formed of the Greek γη, *terra*, "earth;" and μαντεια, "divination;" it being the ancient cuſtom to caſt little pebbles on the ground, and thence to form their conjectures: inſtead of the points afterwards made uſe of. Geomancy.

Polydore Virgil defines geomancy a kind of divination performed by means of clefts or chinks made in the ground; and takes th Perſian Magi to have been the inventors thereof.

GEOMETRY.

INTRODUCTION.

Introduction. THERE is reaſon to believe that geometry, as well as moſt of the other ſciences, was firſt cultivated in Egypt; and, according to ſome authors, it had its origin in the neceſſity there was of aſſigning to the inhabitants every year their particular ſhares of land: for as the country was annually overflowed by the Nile, it has been taken for granted (perhaps without good reaſon), that the land-marks would be obliterated, and the poſſeſſions rendered undiſtinguiſhable from one another. Such is ſaid to have been the origin of land-meaſuring, the form under which geometry was firſt known, and from which it has taken its name; for geometry literally ſignifies *the meaſuring of the earth*.

The hiſtorian *Herodotus* refers the origin of geometry to the time when *Seſoſtris* interſected Egypt by numerous canals, and divided the country among the inhabitants; and this account of the beginning of the ſcience has been conſidered by ſome as very probable.

From Egypt geometry was carried into Greece by *Thales* of Miletus about 600 years before the Chriſtian æra. This celebrated philoſopher is ſaid to have made numerous diſcoveries in geometry; and in particular to have firſt obſerved that any angle in a ſemicircle is a right angle; a diſcovery which gave him great joy, and for which he thanked the muſes by a ſacrifice.

Among the diſciples of *Thales* were *Anaximander* and *Anaxagoras:* the firſt of theſe wrote a elementary treatiſe or introduction to geometry, the earlieſt of which there is any mention in hiſtory; and the laſt is ſaid to have attempted the quadrature of the circle, a problem which has baffled the ſkill of mathematicians of every age.

Pythagoras followed *Thales*, and had the merit of diſcovering one of the moſt beautiful and important propoſitions of the whole ſcience, namely, that the ſquare of the hypothenuſe of a right-angled triangle is equal to the ſquares of the two other ſides. He is ſaid to have been ſo tranſported with joy at this diſcovery, that he ſacrificed a hundred oxen to the gods as a teſtimony of his gratitude. The truth of this anecdote has however been doubted, on account of the philoſopher's moderate fortune and religious opinions concerning the tranſmigration of ſouls.

Zenodorus is the earlieſt of the geometers whoſe writings have reached modern times, a part of them having been preſerved by Theon, in his commentary on Ptolemy.

Hippocrates of Chios cultivated geometry, and diſtinguiſhed himſelf by the quadrature of the curvilineal ſpace contained between half the circumference of one circle, and the fourth part of the circumference of another circle, their concavities being both turned the ſame way, and the radius of the former to that of the latter as 1 to $\sqrt{2}$. He alſo wrote elements of geometry which are now loſt. Introduction.

The founding of the ſchool of Plato forms one of the the earlieſt and moſt important epochs in the hiſtory of geometry; for to that philoſopher we are ſaid to be indebted for the diſcovery of the *Geometrical Analyſis*, by which the ſcience has been greatly extended, and which is indeed abſolutely neceſſary for the reſolution of problems of a certain degree of difficulty.

The Conic Sections, and the theory of *Geometrical Loci*, are commonly reckoned among the improvements which geometry received from his diſciples; and there is reaſon to ſuppoſe that theſe, as well as many other important diſcoveries which we have not room here to enumerate, were firſt ſuggeſted by the attempts of the geometers of the Platonic ſchool to reſolve two celebrated problems, namely, to triſect, or divide into three equal parts, a given angle; and to conſtruct a cube which ſhould be the double of another cube; which laſt problem *Hippocrates* had ſhown to be equivalent to the finding of two mean proportionals between two given lines. The eſteem in which *Plato* held the ſcience of geometry is fully evinced by the following inſcription over the door of his ſchool: *Let no one enter here that is ignorant of geometry.*

The ſcience of geometry was likewiſe cultivated in all its branches by the philoſophers of the Alexandrian ſchool, among whom *Euclid* claims, in a particular manner, our attention. This celebrated mathematician lived about 300 years before the Chriſtian æra, and probably ſtudied geometry at Athens under the diſciples of *Plato*. From Greece he went to Alexandria, allured thither no doubt by the fame of the celebrated ſchool of that city, and by the favours conferred by the firſt *Ptolemy* upon learned men. He compoſed elements of geometry in a ſyſtematic form, comprehending in them ſuch propoſitions belonging to the firſt principles of the ſcience as had been diſcovered by mathematicians previous to his time. This work has had the ſingular good fortune to preſerve the higheſt reputation in all ages and in all countries where ſcience has been cultivated, and it has ſerved as the groundwork of innumerable other treatiſes, few of which, if any, have excelled it. Many commentaries have been written on it, and it has been tranſlated into almoſt all

the

Introduction.

the European and Oriental languages. *Euclid* is likewiſe known to have written other works on geometry: of theſe we have his *Data*, which may be regarded as a continuation of his elements; and an account of a work of his on *poriſms* (ſee PORISMS) preſerved in the writings of *Pappus*, but which has ſuffered ſo much from time as to be almoſt unintelligible.

After *Euclid*, lived *Archimedes*, who cultivated and improved all the branches of the mathematics known at that period, and in a particular manner geometry. He was the firſt that found nearly the ratio of the diameter of a circle to its circumference, and he ſquared the parabola. He likewiſe wrote treatiſes on the Sphere and Cylinder, on Spirals, on Conoids and Spheroids, beſides others on mixt Mathematics. He alſo extended and improved the Geometrical Analyſis, the principles of which had been eſtabliſhed in the ſchool of *Plato*. Many of the writings of *Archimedes* have been loſt; but ſuch as remain prove him to have been one of the greateſt geometers that ever lived, and indeed the NEWTON of antiquity.

Apollonius of Perga was nearly contemporary with *Archimedes*, that is, he flouriſhed about the end of the ſecond century before the Chriſtian æra. He ſtudied geometry in the Alexandrian ſchool under the ſucceſſors of *Euclid*, and he greatly extended the theory of the conic ſections (ſee introduction to CONIC SECTIONS). He alſo compoſed treatiſes on different parts of Geometrical Analyſis, but of theſe only one has come down to us entire; it is entitled *de ſectione rationis*, and was diſcovered in the Arabic tongue, from which it has been tranſlated into Latin by *Dr Halley*. Such accounts however are preſerved in the *mathematical collections of Pappus* of his other treatiſes, that ſeveral of them have been reſtored by modern mathematicians. We may mention in particular his treatiſes *de Locis Planis*, *de Sectione Spatii*, *de Sectione Determinata*, *de Tactionibus*, each of which is divided into two books.

Having mentioned *Archimedes* and *Apollonius*, by far the moſt illuſtrious mathematicians of the period in which they lived, we ſhall paſs over ſeveral others who contributed nothing to the improvement of the ſcience, and therefore are but little known to us. We ſhall however briefly notice *Theodoſius*, who lived about 50 years A. C. and who is the author of a work on Spheries, which is conſidered as one of the moſt valuable of the books on the ancient geometry.

Pappus and *Theon* of Alexandria deſerve to be mentioned as among the moſt celebrated of the commentators and annotators on the ancient geometry. We are particularly indebted to Pappus (who lived about the middle of the fourth century) for our knowledge of various diſcoveries and treatiſes of the ancient geometers, which, but for the account he has given of them in his *mathematical collections*, would have been for ever loſt to mathematicians of modern times.

Proclus, the head of the Platonic ſchool at Athens, cultivated mathematics about the middle of the fifth century; and although it does not appear that he made any diſcoveries in the ſcience, yet he rendered it ſome ſervice by his example and inſtruction. He wrote a commentary on the firſt book of Euclid, which contains many curious obſervations reſpecting the hiſtory and metaphyſics of mathematics.

We have now briefly noticed the principal epochs in the hiſtory of geometry, and the moſt celebrated men who have contributed to its improvement from the earlieſt periods of hiſtory to the end of the fifth century; but long before this time the æra of diſcovery ſeems to have been paſt, and the ſcience on the decline. Still however the Alexandrian ſchool exiſted, and it was poſſible that a *Euclid* or an *Apollonius* might again ariſe in that ſeminary. But the taking of Alexandria by the Arabs in the year 641 gave a death-blow to the ſciences, not only in that capital, but throughout the whole Greek empire. The library, a treaſure of infinite value, was burnt, and the ſtores of learning which had been accumulating for ages were annihilated for ever.

Introduction.

Although by this unfortunate event the ſciences ſuffered an irreparable loſs, it muſt be attributed to the fanaticiſm of the new religion which the conquerors had adopted, rather than to national ignorance or barbarity; for before that period, the ſciences, when on the decline in Greece, had found an aſylum among them, and about 120 years after the death of Mohammed they again took them under their protection.

The Arabs tranſlated the greater part of the works of the Greek geometers, and chiefly thoſe introductory to aſtronomy. They even began to ſtudy the more ſublime geometry of the ancients; for *Apollonius's* Conic Sections became familiar to them, and ſome of the books of that work have only reached us in an Arabic verſion. They gave to Trigonometry its preſent ſimple and commodious form, and greatly ſimplified its operations by the introduction of ſines inſtead of the chords of double arcs, which had been formerly uſed.

After geometry, as well as its kindred mathematica ſciences, had remained for ſeveral centuries under the protection of the Arabs, it was again received into Spain, Italy, and the reſt of Europe, about the year 1400. Among the earlieſt writers on the ſubject after this period, were *Leonardus Piſanus*, and *Lucas Paciolus* or *de Burgo*.

The limits within which we muſt neceſſarily confine this ſketch of the hiſtory of the ſcience, will not, however, allow us to enumerate all the improvements which it has received ſince the reſtoration of letters in Europe; for a liſt of the names of thoſe who have contributed more or leſs to its extenſion, would include almoſt every mathematician of note from the time of Leonardus Piſanus to the preſent day.

The writings of the ancient geometers have been aſſiduouſly ſought after, and held in great repute; for it appears that as far as they carried ſome of their theories, they left but little room for improvement, and of this remark we think the writings of Euclid, of Archimedes, and of Apollonius, afford remarkable inſtances. Euclid's elements of geometry have been conſidered, at leaſt in this country, as one of the beſt books that could be put into the hands of the mathematical ſtudent, particularly that edition of its firſt ſix and eleventh and twelfth books which was given to the world by the late *Dr Simſon*. An excellent ſyſtem of geometry, comprehending the firſt ſix books of the illuſtrious ancient, together with three ſupplementary books, has of late years been publiſhed by *Mr Profeſſor Playfair*, of the Univerſity of Edinburgh. We believe no modern ſyſtem has excelled that of *Euclid*

(as

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(as reſtored to its original purity by Dr Simſon) in reſpect of logical accuracy and ſyſtematic arrangement. There is one, however, which we muſt particularly mention on account of its great excellence, and the uſe we have made of it in the ſyſtem we are now to preſent to our readers. It is that of Mr Legendre, which we conſider as the moſt complete and extenſive that has yet appeared.

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SECT. I. THE FIRST PRINCIPLES.

Definitions.

I. Geometry is a ſcience which treats of the properties and relations of quantities having extenſion, and which are called magnitudes. Extenſion is diſtinguiſhed into length, breadth, and thickneſs.

II. A *Point* is that which has poſition, but not magnitude.

III. A *Line* is that which has only length. Hence the extremities of a line are points, and the interſections of one line with another are alſo points.

IV. A *Straight* or *Right Line* is the ſhorteſt way from one point to another.

V. Every line which is neither ſtraight, nor compoſed of ſtraight lines, is a *Curve Line*. Thus AB is a ſtraight line, ACDB is a line made up of ſtraight lines, and AEB is a curve line.

VI. A *Superficies*, or *Surface*, is that which has only length and breadth. Hence the extremities of a ſuperficies are lines, and the interſections of one ſuperficies with another are alſo lines.

VII. A *Plane Superficies* is that in which any two points being taken, the ſtraight line between them lies wholly in that ſuperficies.

VIII. Every ſuperficies which is neither plane nor compoſed of plane ſuperficies, is a *Curve Superficies*.

IX. A *Solid* is that which has length, breadth, and thickneſs. Hence the boundaries of a ſolid are ſuperficies; and the boundary which is common to two ſolids, which are contiguous, is a ſuperficies.

X. A *Plane Rectilinal Angle* is the inclination of two ſtraight lines to one another, which meet together, but are not in the ſame ſtraight line. The point in which the lines meet one another is called the *Vertex* of the angle.

When there is only one angle at a point, it may be expreſſed by the letter placed at that point; thus the angle contained by the lines EF and EG may be called the angle E: if, however, there be ſeveral angles, as at B, then each is expreſſed by three letters, one of which is the letter that ſtands at the vertex of the angle, and the others are the letters that ſtand ſomewhere upon the lines containing the angle, the letter at the vertex being placed between the other two. Thus the angle contained by the lines BA and BD is called the angle ABD or DAB.

Angles in common with other quantities admit of addition, ſubtraction, multiplication, and diviſion. Thus the ſum of the angles ABD and DBC is the angle ABC; the difference of the angles ABC and ABD is the angle DBC.

XI. When a ſtraight line ſtanding on another ſtraight line makes the adjacent angles equal to one another, each of them is called a *Right Angle*, and the ſtraight line which ſtands on the other is called a *Perpendicular* to it. Thus, if DC meet AB, and make the angles ACD, DCB equal to one another; each of them is a right angle, and DC is a perpendicular to AB.

XII. An *Obtuſe Angle* is that which is greater than a right angle, and an *Acute Angle* is that which is leſs than a right angle. Thus ABC being ſuppoſed a right angle, DBC is an obtuſe angle, and EBC an acute angle. Fig. 4.

XIII. *Parallel Straight Lines* are ſuch as are in the ſame plane, and which being produced ever ſo far both ways, do not meet. Fig. 5.

XIV. A *Plane Figure* is a plane terminated every where by lines.

If the lines be ſtraight, the ſpace which they enclose is called a *Rectilineal* figure, or a *Polygon*, and the lines themſelves conſtitute the *Perimeter* of the polygon. Fig. 6.

XV. When a polygon has three ſides (which is the ſmalleſt number it can have) it is called a *Triangle*; when it is has four, it is called a *Quadrilateral*; when it has five, a *Pentagon*; when ſix, a *Hexagon*, &c.

XVI. An *Equilateral* triangle is that which has three equal ſides (fig. 7.); an *Iſoſceles* triangle is that which has only two equal ſides (fig. 8.); and a *Scalene* triangle is that which has all its ſides unequal (fig. 9.). Fig. 7. 8. 9.

XVII. A *Right-angled* triangle is that which has a right angle; the ſide oppoſite to the right angle is called the *Hypothenuſe*. Thus in the triangle ABC, having the angle at B a right angle, the ſide AC is the hypothenuſe. Fig. 10.

XVIII. An *Obtuſe-angled* triangle is that which has an obtuſe angle (fig. 9.); and an *acute-angled* triangle is that which has three acute angles (fig. 11.). Fig. 9. 11.

XIX. Of quadrilateral figures, a *ſquare* is that which has all its ſides equal, and all its angles right angles (fig. 12.). A *Rectangle* is that which has all its angles right angles, but not all its ſides equal, (fig. 13.). A *Rhombus* is that which has all its ſides equal, but its angles are not right angles, (fig. 14.). A *Parallelogram*, or *Rhomboid*, is that which has its oppoſite ſides parallel (fig. 15.). A *Trapezoid* is that which has only two of its oppoſite ſides parallel, (fig. 16.). Fig. 12. 13. 14. 15. 16.

XX. A *Diagonal* is a ſtraight line which joins the vertices of two angles, which are not adjacent to each other; ſuch is AC. Fig. 89.

XXI. An *Equilateral Polygon* is that which has all its ſides equal; and an *Equiangular Polygon* is that which has all its angles equal. If a polygon be both equilateral and equiangular, it is called a *Regular Polygon*.

XXII. Two polygons are *equilateral* between themſelves, when the ſides of the one are equal to the ſides of the other, each to each, and in the ſame order; that is, when in going about each of the figures in the ſame direction, the firſt ſide of the one is equal to the firſt ſide of the other; the ſecond ſide of the one is equal to the

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the ſecond ſide of the other; the third to the third, and ſo on. The ſame is to be underſtood of two polygons which are *equiangular* between themſelves.

Explanation of Terms.

An *Axiom* is a propoſition, the truth of which is evident at firſt ſight.

A *Theorem* is a truth which becomes evident by a proceſs of reaſoning called *Demonſtration*.

A *Problem* is a queſtion propoſed, which requires a ſolution.

A *Lemma* is a ſubſidiary truth employed in the demonſtration of a theorem, or the ſolution of a problem.

The common name of *Propoſition* is given indifferently to theorems, problems, and lemmas.

A *Corollary* is a conſequence which follows from one or ſeveral propoſitions.

A *Scholium* is a remark upon one or more propoſitions that have gone before, tending to ſhow their connection, their reſtriction, their extenſion, or the manner of their application.

A *Hypotheſis* is a ſuppoſition made either in the enunciation of a propoſition, or in the courſe of a demonſtration.

Explanation of Signs.

That the demonſtrations may be more conciſe, we ſhall make uſe of the following ſigns borrowed from Algebra; and in employing them we ſhall take for granted that the reader is acquainted with at leaſt the manner of notation and firſt principles of that branch of mathematics.

To expreſs that two quantities are equal the ſign $=$ is put between them; thus $A = B$, ſignifies that the quantity denoted by A is equal to the quantity denoted by B.

To expreſs that A is leſs than B, they are written thus; $A \angle B$.

To expreſs that A is greater than B, they are written thus; $A \rangle B$.

The ſign $+$ (read *plus*) written between the letters which denote two quantities, indicates that the quantities are to be added together; thus $A+B$ means the ſum of the quantities A and B.

The ſign $-$ (read *minus*) written between two letters, means the exceſs of the one quantity above the other; thus $A-B$ means the exceſs of the quantity denoted by A above the quantity denoted by B. The ſigns $+$ and $-$ will ſometimes occur in the ſame expreſſion; thus $A+C-D$ means that D is to be ſubtracted from the ſum of A and C, alſo $A-D+C$ means the ſame thing.

The ſign $\times$ put between two quantities means their product, if they be conſidered as numbers; but if they be conſidered as lines, it ſignifies a rectangle having theſe lines for its length and breadth; thus $A \times B$ means the product of two numbers A and B; or elſe a rectangle having A and B for the ſides about one of its right angles. We ſhall likewiſe indicate the product of two quantities, in ſome caſes, by writing the letters cloſe together; thus *m* A will be uſed to expreſs the product of *m* and A, and ſo on with other expreſſions, agreeable to the common notation in algebra.

The expreſſion A^2 means the ſquare of the quantity A, and A^3 means the cube of A; alſo PQ^2, and PQ^3 mean, the one the ſquare, and the other the cube, of a line whoſe extremities are the points P and Q. First Principles.

On the other hand, the ſign $\surd$ indicates a root to be extracted; thus $\surd A \times B$ means the ſquare root of the product of A and B.

Axioms.

1. Two quantities, each of which is equal to a third, are equal to one another.
2. The whole is greater than its part.
3. The whole is equal to the ſum of all its parts.
4. Only one ſtraight line can be drawn between two points.
5. Two magnitudes, whether they be lines, ſurfaces, or ſolids, are equal, when, being applied the one to the other, they coincide with one another entirely, that is, when they exactly fill the ſame ſpace.
6. All right angles are equal to one another.

Note.—The references are to be underſtood thus: (7.) refers to the 7th propoſition of the ſection in which it occurs; (4. 2.) means the 4th propoſition of the 2d ſection; (2. cor. 28. 4.) means the 2d corollary to the 28th propoſition of the 4th ſection.

Theorem I.

A ſtraight line CD, which meets with another AB, makes with it two adjacent angles, which, taken together, are equal to two right angles. Fig. 17.

At the point C let CE be perpendicular to AB. The angle ACD is the ſum of the angles ACE, ECD; therefore, ACD+BCD is the ſum of the three angles ACE, ECD, BCD. The firſt of theſe is a right angle, and the two others are together equal to a right angle; therefore, the ſum of the two angles ACD, BCD, is equal to two right angles.

Cor. 1. If one of the angles is a right angle, the other is alſo a right angle.

Cor. 2. All the angles ACE, ECD, DCF, FCB, at the ſame point C, on the ſame ſide of the line AB, are taken together, equal to two right angles. For their ſum is equal to the two angles ACD, DCB. Fig. 18.

Theorem II.

Two ſtraight lines which coincide with each other in two points, alſo coincide in all their extent, and form but one and the ſame ſtraight line.

Let the points which are common to the two lines be A and B; in the firſt place it is evident that they muſt coincide entirely between A and B; otherwiſe, two ſtraight lines could be drawn from A to B, which is impoſſible (axiom 4.). Now let us ſuppoſe, if poſſible, that the lines when produced ſeparate from each other at a point C, the one becoming ACD, and the other ACE. At the point C let CF be drawn, ſo as to make the angle ACF a right angle; then, ACE being a ſtraight line, the angle FCE is a right angle (1. cor. 1.); and becauſe ACD is a ſtraight line, the angle Fig. 19.

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angle FCD is alſo a right angle, therefore the angle FCE is equal to FCD, a part to the whole, which is impoſſible; therefore the ſtraight lines which have the common points A, B cannot ſeparate when produced, therefore they muſt form one and the ſame ſtraight line.

THEOREM III.

Fig. 20. If two adjacent angles ACD, DCB make together two right angles, the two exterior lines AC, CB, which form theſe angles, are in the ſame ſtraight line.

FOR if CB is not the line AC produced, let CE be that line produced, then, ACE being a ſtraight line, the angles ACD, DCE are together equal to two right angles (1.); but, by hypotheſis, the angles ACD, DCB are together equal to two right angles, therefore ACD+DCB=ACD+DCE. From theſe equals take away the common angle ACD, and the remaining angles DCB, DCE are equal, that is, a part equal to the whole, which is impoſſible, therefore CB is the line AC produced.

THEOREM IV.

Fig. 21. If two ſtraight lines AB, DE cut each other, the vertical or oppoſite angles are equal.

FOR ſince DE is a ſtraight line, the ſum of the angles ACD, ACE is equal to two right angles (1.), and ſince AB is a ſtraight line, the ſum of the angles ACE, BCE is equal to two right angles, therefore the ſum ACD+ACE is equal to the ſum ACE+BCE; from each of theſe take away the ſame angle ACE, and there remains the angle ACD equal to its oppoſite angle BCE.

In like manner, it may be demonſtrated, that the angle ACE is equal to its oppoſite angle BCD.

COR. 1. From this it appears, that if two ſtraight lines cut one another, the angles they make at the point of their interſection are, together, equal to four right angles.

COR. 2. And hence all the angles made by any number of lines meeting in one point are, together, equal to four right angles.

THEOREM V.

Fig. 22. Two triangles are equal, when they have an angle, and the two ſides containing it of the one equal to an angle, and the two ſides containing it of the other, each to each.

LET the triangles ABC, DEF have the angle A equal to the angle D, the ſide AB equal to DE, and the ſide AC equal to DF; the triangles ſhall be equal. For if the triangle ABC be applied to the triangle DEF, ſo that the point A may be on D, and the line AB upon DE, then the point B ſhall coincide with E, becauſe AB=DE; and the line AC ſhall coincide with DF, becauſe the angle BAC is equal to EDF; and the point C ſhall coincide with F, becauſe AC=DF; and ſince B coincides with E, and C with F, the line BC ſhall coincide with EF, and the two triangles ſhall coincide exactly, the one with the other; therefore they are equal (ax. 5.).

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COR. Hence it follows, that the baſes, or third ſides BC, EF of the triangles are equal, and the remaining angles B, C of the one are equal to the remaining angles E, F of the other, each to each, namely, thoſe to which the equal ſides are oppoſite.

THEOREM VI.

Two triangles are equal, when they have a ſide, and the two adjacent angles of the one equal to a ſide, and the two adjacent angles of the other, each to each. Fig. 22.

LET the ſide BC be equal to the ſide EF, the angle B to the angle E, and the angle C to the angle F, the triangle ABC ſhall be equal to the triangle DEF. For if the triangle ABC be applied to the triangle DEF, ſo that the equal ſides BC, EF may coincide; then becauſe the angle B is equal to E, the ſide BA ſhall coincide with ED, and therefore the point A ſhall be ſomewhere in ED; and becauſe the angle C is equal to F, the ſide CA ſhall coincide with FD, and therefore the point A ſhall be ſomewhere in FD; now the point A being ſomewhere in the lines ED, and FD, it can only be at D their interſection; therefore the two triangles ABC, DEF muſt entirely coincide, and be equal to one another.

COR. Hence it appears that the remaining angles A, D of the triangles are equal, and the remaining ſides AB, AC of the one are equal to the remaining ſides DE, DF of the other, each to each, viz. thoſe to which the equal angles are oppoſite.

THEOREM VII.

Any two ſides of a triangle are together greater than the third. Fig. 22.

FOR the ſide BC, for example, being the ſhorteſt way between the points B, C, (def. 4.) muſt be leſs than BA+AC.

THEOREM VIII.

If from a point O, within a triangle ABC, there be drawn ſtraight lines OB, OC to the extremities of BC one of its ſides, the ſum of theſe lines ſhall be leſs than that of AB, AC the two other ſides. Fig 23.

LET BO be produced to meet CA in D; becauſe the ſtraight line OC is leſs than OD+DC, to each of theſe add BO, and BO+OC$\angle$BO+OD+DC; that is BO+OC$\angle$BD+DC.

Again, ſince BD$\angle$BA+AD, to each of theſe add DC and we have BD+DC$\angle$BA+AC, but it has been ſhewn that BO+OC$\angle$BD+DC, much more then is BO+OC$\angle$BA+AC.

THEOREM IX.

If two ſides AB, AC of a triangle ABC are equal to two ſides DE, DF of another triangle DEF, each to each; but if the angle BAC contained Fig. 24. Fig. 25. Fig. 26.

by the former is greater than the angle EDF contained by the latter; the third side BC of the first triangle shall be greater than the third side EF of the second.

SUPPOSE AG drawn so that the angle CAG=D, take AG=DE and join CG; then the triangle GAC is equal to the triangle EDF, (6.) and therefore GC=EF. Now there may be three cases, according as the point G falls without the triangle BAC, or on the side BC, or within the same triangle.

Fig. 24. CASE I. Because GC$\angle$GI+IC, and AB$\angle$AI+IB, (7.) therefore GC+AB$\angle$GI+AI+IC+IB, that is GC+AB$\angle$AG+BC, from each of these unequal quantities take away the equal quantities AB, AG, and there remains GC$\angle$BC, therefore EF$\angle$BC.

Fig. 25. CASE II. If the point G fall upon the side BC, then it is evident that GC, or its equal EF, is less than BC.

Fig. 26. CASE III. Lastly, if the point G fall within the triangle BAC, then AG+GC$\angle$AB+BC, (8.) therefore, taking away the equal quantities AG, AB, there remains GC$\angle$BC or EF$\angle$BC.

COR. Hence, conversely, if EF be less than BC, the angle EDF is less than BAC; for the angle EDF cannot be equal to BAC, because then (5.) EF would be equal to BC; neither can the angle EDF be greater than BAC, for then (by the theor.) EF would be greater than BC.

THEOREM X.

Fig. 22. Two triangles are equal, when the three sides of the one are equal to the three sides of the other, each to each.

LET the side AB=DE, AC=DF, and BC=EF; then shall the angle A=D, B=E, C=F.

For if the angle A were greater than D, as the sides AB, AC, are equal to DE, DF, each to each, it would follow, (9.) that BC would be greater than EF, and if the angle A were less than the angle D, then BC would be less than EF; but BC is equal to EF, therefore the angle A can neither be greater nor less than the angle D, therefore it must be equal to it. In the same manner it may be proved, that the angle B=E, and that the angle C=F.

SCHOLIUM.

It may be remarked, as in THEOREM V. and THEOREM VI. that the equal angles are opposite to the equal sides.

THEOREM XI.

Fig. 27. In an isosceles triangle the angles opposite to the equal sides are equal to one another.

LET the side AB=AC, then shall the angle C=B.

Suppose a straight line drawn from A the *vertex* of the triangle to D the middle of its base; the two triangles ABD, ACD have the three sides of the one equal to the three sides of the other, each to each, namely AD common to both, AB=AC, by hypothesis, and BD=DC, by construction, therefore (preced. theor.) the angle B is equal to the angle C.

COR. Hence every equilateral triangle is also equiangular.

SCHOLIUM.

FROM the equality of the triangles ABD, ACD, it follows, that the angle BAD=DAC, and that the angle BDA=ADC; therefore these two last are right angles. Hence it appears, that a straight line drawn from the vertex of an isosceles triangle to the middle of its base is perpendicular to that base, and divides the vertical angle into two equal parts.

In a triangle that is not isosceles, any one of its three sides may be taken indifferently for a *base*; and then its *vertex* is that of the opposite angle. In an isosceles triangle, the base is that side which is not equal to the others.

THEOREM XII.

If two angles of a triangle are equal, the opposite sides are equal, and the triangle is isosceles. Fig. 28.

LET the angle ABC=ACB, the side AC shall be equal to the side AB. For if the sides are not equal, let AB be the greater of the two; take BD=AC, and join CD; the angle DBC is by hypothesis equal to ACB, and the two sides DB, BC are equal to the two sides AC, BC, each to each; therefore the triangle DBC is equal to the triangle ACB; (5.) but a part cannot be equal to the whole; therefore the sides AB, AC cannot be unequal, that is, they are equal, and the triangle is isosceles.

THEOREM XIII.

Of the two sides of a triangle, that is the greater which is opposite to the greater angle; and conversely, of the two angles of a triangle, that is the greater which is opposite to the greater side. Fig. 29.

FIRST, let the angle C$>$B, then shall the side AB opposite to C be greater than the side AC opposite to B. Suppose CD drawn, so that the angle BCD=B; in the triangle BDC, BD is equal to DC, (12.) but AD+DC$>$AC, and AD+DC=AD+DB=AB, therefore AB$>$AC.

Next, let the side AB$>$AC, then shall the angle C opposite to AB, be greater than the angle B, opposite to AC. For if C were less than B, then, by what has been demonstrated, AB$\angle$AC, which is contrary to the hypothesis of the proposition, therefore C is not less than B: and if C were equal to B, then it would follow that AC=AB, (12.) which is also contrary to the hypothesis; therefore C is not equal to B, therefore it is greater.

THEOREM XIV.

From a given point A without a straight line DE, no more than one perpendicular can be drawn to that line. Fig. 30.

FOR suppose it possible to draw two, AB and AC; produce

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produce one of them AB, ſo that BF=AB, and join CF. The triangle CBF is equal to the triangle ABC, for the angle CBF is a right angle, as well as CBA, and the ſide BF=BA; therefore the triangles are equal, (5.) and hence the angle BCF=BCA; but the angle BCA is by hypotheſis a right angle; therefore the angle BCF is alſo a right angle; hence AC and CF lie in a ſtraight line, (3.) and conſequently two ſtraight lines ACF, ABF may be drawn between two points, A, F, which is impoſſible, (ax. 4.) therefore it is equally impoſſible that two perpendiculars can be drawn from the ſame point to the ſame ſtraight line.

Theorem XV.

Fig. 30.

If from a point A, without a ſtraight line, DE, a perpendicular AB be drawn upon that line, and alſo different oblique lines AE, AC, AD, &c. to different points of the ſame line.

Firſt, The perpendicular AB ſhall be ſhorter than any one of the oblique lines.

Secondly, The two oblique lines AC, AE, which meet the line DE on oppoſite ſides of the perpendicular, and at equal diſtances BC, BE from it, are equal to one another.

Laſtly, Of any two oblique lines AC, AD, or AE, AD, that which is more remote from the perpendicular is the greater.

Produce the perpendicular AB, ſo that BF=BA, and join FC, FD.

1. The triangle BCF is equal to the triangle BCA; for the right angle CBF=CBA, the ſide CB is common, and the ſide BF=BA, therefore the third ſide CF=AC, (5.) but AF$\angle$AC+CF, (7.) that is 2AB$\angle$2AC; therefore AB$\angle$AC, that is, the perpendicular is ſhorter than any one of the oblique lines.

2. If BE=BC, then, as AB is common to the two triangles ABE, ABC, and the right angle ABE=ABC, the triangles ABE, ABC ſhall be equal, (5.) and AE=AC.

3. In the triangle DFA, the ſum of the lines AD, DF is greater than the ſum of AC, CF, (8.) that is, 2AD$\rangle$2AC; therefore AD$\rangle$AC, that is, the oblique line, which is more remote from the perpendicular, is greater than that which is nearer.

Cor. 1. The perpendicular meaſures the diſtance of any point from a ſtraight line.

Cor. 2. From the ſame point, three equal ſtraight lines cannot be drawn to terminate in a given ſtraight line; for if they could be drawn, then, two of them would be on the ſame ſide of the perpendicular, and equal to each other, which is impoſſible.

Theorem XVI.

Fig. 31.

If from C, the middle of a ſtraight line AB, a perpendicular CD be drawn to that line. Firſt, Every point in the perpendicular is equally diſtant from the extremities of the line AB. Secondly, Every point without the perpendicular is at unequal diſtances from the ſame extremities A, B.

1. Let D be any point in CD, then, becauſe the two oblique lines DA, DB are equally diſtant from the perpendicular, they are equal to one another (15.), therefore every point in CD is equally diſtant from the extremities of AB.

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2. Let E be a point out of the perpendicular; join EA, EB, one of theſe lines muſt cut the perpendicular in F; join BF, then AF=BF, and AE=BF+FE; but BF+FE$\rangle$BE, (7.) therefore AE$\rangle$BE, that is, E any point out of the perpendicular is at unequal diſtances from the extremities of AB.

Theorem XVII.

Plate CCXLI. Fig. 32.

Two right-angled triangles are equal, when the hypothenuſe and a ſide of the one are equal to the hypothenuſe and a ſide of the other, each to each.

Let the hypothenuſe AC=DF, and the ſide AB=DE; the triangle ABC ſhall be equal to DEF. The propoſition will evidently be true (10.) if the remaining ſides BC, EF are equal. Now, if it be poſſible to ſuppoſe that they are unequal, let BC be the greater, take BG=EF, and join AG; then the triangles ABG, DEF, having the ſide AB=DE, BG=EF, and the angle B=E, will be equal to one another (5.), and will have the remaining ſide AG=DF; but by hypotheſis DF=AC; therefore AG=AC; but AG cannot be equal to AC (15.), therefore it is impoſſible that BC can be unequal to EF, and therefore the triangles ABC, DEF are equal to one another.

Theorem XVIII.

Fig. 33.

Two ſtraight lines AC, ED, which are perpendicular to a third ſtraight line AE, are parallel to each other.

For if they could meet at a point O, then two perpendiculars OA, OE, might be drawn from the ſame point O, to the ſtraight line AE, which is impoſſible (14.).

In the next theorem, it is neceſſary to aſſume another axiom, in addition to thoſe already laid down in the beginning of this ſection.

Axiom.

Fig. 34.

7. If two points E, G in a ſtraight line AB are ſituated at unequal diſtances EF, GH from another ſtraight line CD in the ſame plane, theſe two lines, when indefinitely produced, on the ſide of the leaſt diſtance GH, will meet each other.

Theorem XIX.

Fig. 35.

If two ſtraight lines AB, CD be parallel, the perpendiculars EF, GH to one of the lines, which are terminated by the other line, are equal, and are perpendicular to both the parallels.

For if EF and GH, which are perpendicular to CD, were unequal, the lines AB, CD would meet each other (by the above axiom) which is contrary to the ſuppoſition that they are parallel. And if EF, GH be

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not perpendicular to AB, let EK be perpendicular to EF, meeting GH in K; then becauſe EK and FH are perpendicular to EF, they are parallel (18.), and therefore, by what has been juſt ſhewn, the perpendiculars EF, KH, muſt be equal; but by hypotheſis EF=GH, therefore KH=GH, which is impoſſible; therefore EF is perpendicular to AB; and in the ſame way it may be ſhewn that GH is perpendicular to AB.

Cor. Hence it appears, that through the ſame point E, no more than one parallel can be drawn to the ſame ſtraight line CD.

Theorem XX.

Fig. 36. Straight lines AB, EF, which are parallel to the ſame ſtraight line CD, are parallel to each other.

For let HKG be perpendicular to CD, it will alſo be perpendicular to both AB and EF (19.), therefore theſe laſt lines are parallel to each other.

Theorem XXI.

Fig. 37. If a ſtraight line EF meet two parallel ſtraight lines AB, CD, it makes the alternate angles AEF, EFD equal.

Let EH and GF be perpendicular to CD, then theſe lines will be parallel (18.), and alſo at right angles to AB (19.), and therefore FH and GE are equal to one another (19.), therefore the triangles FGE, FHE, having the ſide FG=HE, and GE=FH, and FE common to both, will be equal; and hence the angle FEG will be equal to EFH, that is, FEA will be equal to EFD.

Cor. 1. Hence if a ſtraight line KL interſect two parallel ſtraight lines AB, CD, it makes the exterior angle KEB equal to the interior and oppoſite angle EFD on the ſame ſide of the line. For the angle AEF=KEB, and it has been ſhewn that AEF=EFD; therefore KEB=EFD.

Cor. 2. Hence alſo, if a ſtraight line EF meet two parallel ſtraight lines AB, CD, it makes the two interior angles BEF, EFD on the ſame ſide together, equal to two right angles. For the angle AEF has been ſhewn to be equal to EFD, therefore, adding the angle FEB to both, AEF + FEB=EFD+FEB; but AEF+FEB is equal to two right angles, therefore the ſum EFD+FEB is alſo equal to two right angles.

Theorem XXII.

Fig. 38. If a ſtraight line EF, meeting two other ſtraight lines AB, CD, makes the alternate angles AEF, EFD equal, thoſe lines ſhall be parallel.

For if AE is not parallel to CD, ſuppoſe, if poſſible, that ſome other line KE can be drawn through E, parallel to CD; then the angle KEF muſt be equal to EFD (21.), that is (by hypotheſis), to AEF, which is impoſſible; therefore, neither KE, nor any other line drawn through E, except AB, can be parallel to CD.

Cor. If a ſtraight line EF interſecting two other ſtraight lines AB, CD, makes the exterior angle GEB equal to the interior and oppoſite angle EFD on the ſame ſide; or the two interior angles BEF, EFD on the ſame ſide equal to two right angles; in either caſe the lines are parallel. For, if the angle GEB=EFD, then alſo AEF=EFD, (4.). And if BEF+EFD= two right angles, then, becauſe BEF+AEF=two right angles (1.), BEF+EFD=BEF+AEF, and taking BEF from both, EFD=AEF, therefore (by the theorem) in each caſe the lines are parallel.

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Theorem XXIII.

If a ſide AC of a triangle ABC be produced towards D, the exterior angle BCD is equal to both the interior and oppoſite angles BAC, ABC. Fig. 39.

Let CE be parallel to AB, then the angle B=BCE, (21.) and the angle A=ECD, (1 cor. 21.) therefore B+A=BCE+ECD=BCD.

Cor. The exterior angle of a triangle is greater than either of the interior oppoſite angles.

Theorem XXIV.

The three interior angles of a triangle ABC taken together are equal to two right angles. Fig. 40.

For if AC be produced to D, then A+B=BCD, (23.); to each of theſe equal quantities add ACB, then ſhall A+B+ACB=BCD+BCA; but BCD+BCA =two right angles, (1.) therefore A+B+ACB =two right angles.

Cor. 1. If two angles of one triangle be equal to two angles of another triangle, each to each; the third angle of the one ſhall be equal to the third angle of the other, and the triangles ſhall be equiangular.

Cor. 2. If two angles of a triangle, or their ſum, be given, the third angle may be found, by ſubtracting their ſum from two right angles,

Cor. 3. In a right-angled triangle, the ſum of the two acute angles is equal to a right angle.

Cor. 4. In an equilateral triangle, each of the angles is equal to the third part of two right angles, or to two thirds of one right angle.

Theorem XXV.

The ſum of all the interior angles of a polygon is equal to twice as many right angles wanting four as the figure has ſides. Fig 41.

Let ABCDE be a polygon; from a point F within it draw ſtraight lines to all its angles, then the polygon ſhall be divided into as many triangles as it has ſides; but the ſum of the angles of each triangle is equal to two right angles, (24.) therefore the ſum of all the angles of the triangles is equal to twice as many right angles as there are triangles, that is, as the figure has ſides; but the ſum of all the angles of the triangles is equal

Of the Circle.

equal to the sum of all the angles of the polygon, together with the sum of the angles at the point F, which last sum is equal to four right angles, (2 Cor. 4.) therefore the sum of all the angles of the polygon, together with four right angles, is equal to twice as many right angles as the figure has sides, and consequently the sum of the angles of the polygon is equal to twice as many right angles, wanting four, as the figure has sides.

Cor. The four interior angles of a quadrilateral are taken together equal to four right angles.

Theorem XXVI.

Fig. 42. The opposite sides of a parallelogram are equal, and the opposite angles are also equal.

Draw the diagonal BD; the two triangles ADB, DBC have the side BD common to both, and AB, DC being parallel, the angle ABD=BDC (21.) also AD, BC being parallel, the angle ADB=DBC, therefore the two triangles are equal (6.), and the side AB, opposite to the angle ADB, is equal to DC, opposite to the equal angle DBC. In like manner the third side AD is equal to the third side BC, therefore the opposite sides of a parallelogram are equal.

In the next place, because of the equality of the same triangles, the angle A is equal to the angle C, and also the angle ADC composed of the two angles ADB, BDC is equal to the angle ABC composed of the angles CBD, DBA; therefore the opposite angles of a parallelogram are also equal.

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Theorem XXVII.

If the opposite sides of a quadrilateral ABCD are Fig. 42. equal, so that AB=DC, and AD=BC; then the equal sides are parallel, and the figure is a parallelogram.

Draw the diagonal BD. The two triangles ABD, CDB have the three sides of the one equal to the three sides of the other, each to each, therefore the triangles are equal (10.); and the angle ADB, opposite to AB, is equal to DBC opposite to DC, therefore the side AD is parallel to BC (22.). For a similar reason AB is parallel to DC; therefore the quadrilateral ABCD is a parallelogram.

Theorem XXVIII.

If two opposite sides AB, DC, of a quadrilateral Fig. 42. are equal and parallel, the two other sides are in like manner equal and parallel; and the figure is a parallelogram.

Draw the diagonal BD. Because AB is parallel to CD, the alternate angles ABD, BDC are equal, (21.); now the side AB=DC, and DB is common to the triangles ABD, BDC, therefore these triangles are equal, (5.) and hence the side AD=BC, and the angle ADB=DBC, consequently AD is parallel to BC, (22.) therefore the figure ABCD is a parallelogram.

SECT. II. OF THE CIRCLE.

Definitions.

Fig. 43. I. A *Circle* is a plane figure contained by one line which is called the *circumference*, and is such, that all straight lines drawn from a certain point within the figure to the circumference, are equal to one another.

And this point is called the *centre* of the circle.

II. Every straight line CA, CE, CD, &c. drawn from the centre to the circumference, is called a *radius* or *semidiameter;* and every straight line, such as AB, which passes through the centre, and is terminated both ways by the circumference, is called a *diameter.*

Hence it follows that all the radii of a circle are equal, and all the diameters are also equal, each being the double of the radius.

III. An *Arch* of a circle is any portion of its circumference, as FHG.

The *chord* or *subtense* of an arch is the straight line FG which joins its extremities.

IV. A *Segment* of a circle is the figure contained by an arch, and its chord. If the figure be the half of the circle it is called a *Semicircle.*

Note. Every chord corresponds to two arches, and consequently to two segments; but in speaking of these, it is always the smallest that is meant, unless the contrary be expressed.

V. A *Sector* of a circle is the figure contained by an arch DE and the two radii CD, CE, drawn to the extremities of the arch. If the radii be at right angles to each other it is called a *Quadrant.*

VI. A straight line is said to be *placed* or *applied* in a circle, when its extremities are in the circumference of the circle as FG. Plate CCXLIII. fig. 115.

VII. A rectilineal figure is said to be *inscribed* in a circle when the vertices of all its angles are upon the circumference of the circle; in this case the circle is said to be *circumscribed* about the figure.

VIII. A straight line is said to *touch* a circle, or to be a *tangent* to a circle, when it meets the circumference in one point only; such, for example, is BD, fig. 49. The point A which is common to the straight line and circle, is called *the Point of Contact.*

IX. A polygon is said to be *described* or *circum-* Fig. 118. *scribed* about a circle when all its sides are tangents to the circle; and in this case the circle is said to be *inscribed* in the polygon.

Theorem I.

Plate CCXLI. fig. 43.

Any diameter AB, divides the circle and its circumference into two equal parts.

For if the figure AEB be applied to AFB, so that the base AB may be common to both, the curve line AEB must fall exactly upon the curve line AFB; otherwise there would be points in the one or the other unequally distant from the centre, which is contrary to the definition of a circle.

Theorem

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THEOREM II.

Every chord is leſs than the diameter.

Fig. 44.

LET the radii CA, CD be drawn from the centre to the extremities of the chord AD; then the ſtraight line AD is leſs than AC+CD, that is AD$\angle$AB.

THEOREM III.

A ſtraight line cannot meet the circumference of a circle in more than two points.

FOR if it could meet it in three, theſe three points would be equally diſtant from the centre, and therefore three equal ſtraight lines might be drawn from the ſame point to the ſame ſtraight line, which is impoſſible (2 cor. 15. 1.).

THEOREM IV.

Fig. 45. In the ſame circle, or in equal circles, equal arches are ſubtended by equal chords, and, converſely, equal chords ſubtend equal arches.

IF the radius AC be equal to the radius EO, and the arch AMD equal to the arch ENG; the chord AD ſhall be equal to the chord EG.

For the diameter AB being equal to the diameter EF, the ſemicircle AMDB may be applied exactly upon the ſemicircle ENGF, and then the curve line AMDB ſhall coincide entirely with the curve line ENGF, but the arch AMD being ſuppoſed equal to ENG, the point D muſt fall upon G, therefore the chord AD is equal to the chord EG.

Converſely, if the chord AD=EG, the arch AMD is equal to the arch ENG.

For if the radii CD, OG be drawn, the two triangles ACD, EOG have three ſides of the one equal to three ſides of the other, each to each, viz. AC=EO, CD=OG and AD=EG, therefore theſe triangles are equal, (10. 1.) and hence the angle ACD=EOG. Now if the ſemicircle ADB be placed upon EGF, becauſe the angle ACD=EOG, it is evident that the radius CD will fall upon the radius OG, and the point D upon G, therefore the arch AMD is equal to the arch ENG.

THEOREM V.

Fig. 45. In the ſame circle, or in equal circles, the greater arch is ſubtended by the greater chord, and, converſely, (if the arch be leſs than half the circumference) the greater chord ſubtends the greater arch.

For let the arch AH be greater than AD, and let the chords AD, AH, and the radii CD, CH be drawn. The two ſides AC, CH, of the triangle ACH, are equal to the two ſides AC, CD, of the triangle ACD; and the angle ACH is greater than ACD; therefore the third ſide AH is greater than the third ſide AD, (9. 1.) therefore the chord which ſubtends the greater arch is the greater. Converſely, if the chord AH be greater than AD, it may be inferred (cor. 9. 1.) from the ſame triangles that the angle ACH is greater than ACD, and that thus the arch AH is greater than AD.

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Note. Each of the arches is here ſuppoſed leſs than half the circumference; if they were greater, the contrary property would have place, the arch increaſing as the chord diminiſhes.

THEOREM VI.

The radius CG, perpendicular to a chord AB, Fig. 46. biſects the chord (or divides it into two equal parts), it alſo biſects the arch AGB ſubtended by the chord.

DRAW the radii CA, CB; theſe radii are two equal oblique lines in reſpect of the perpendicular CD, therefore they are equally diſtant from the perpendicular (15. 1.) that is AD=DB.

In the next place, becauſe CG is perpendicular to the middle of AB, every point in CG is at equal diſtances from A and B, (16. 1.) therefore, if GA, GB be drawn, theſe lines are equal, and as they are the chords of the arches AG, BG, the arches are alſo equal. (4.).

SCHOLIUM.

Since the centre C, the middle D of the chord AB, and the middle G of the arch ſubtended by that chord, are three points ſituated in the ſame ſtraight line perpendicular to that chord; and that two points in a ſtraight line are ſufficient to determine its poſition; it follows, that a ſtraight line which paſſes through any two of theſe points muſt neceſſarily paſs through the third; and muſt be perpendicular to the chord. It alſo follows, that a perpendicular to the middle of a chord paſſes through the centre, and the middle of the arch ſubtended by that chord.

THEOREM VII.

If three points A, B, C, be taken in the circum- Fig. 47. ference of a circle, no other circumference which does not coincide with the former, can be made to paſs through the ſame three points.

LET the chords AB, BC be drawn, and let OD, OF be drawn from the centre, perpendicular to, and conſequently biſecting thoſe chords. The centre of every circle paſſing through A and B muſt neceſſarily be ſomewhere in the perpendicular DO, (laſt theor.) and in like manner the centre of every circle paſſing through B and C, muſt be ſomewhere in the perpendicular OF, therefore the centre of a circle paſſing through A, B, and C, muſt be in the interſection of the perpendiculars DO, FO; and conſequently can only be at one and the ſame point O; therefore, only one circle can be made to paſs through the ſame three points A, B, C.

COR. One circumference of a circle cannot interſect another in more than two points, for if they could have three common points they would have the ſame centre, and conſequently would coincide with each other.

THEOREM VIII.

Two equal chords are equally diſtant from the Fig. 48. centre;

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centre; and of unequal chords, that which is nearer the centre is greater than that which is more remote.

LET the chord AB=DE, ſuppoſe the chords biſected by the perpendiculars CF, CG, from the centre, and draw the radii CA, CD. The right-angled triangles CAF, CDG have equal hypothenuſes CA, CD; the ſide AF ($=\frac{1}{2}$AB) of the one is alſo equal to the ſide DG ($=\frac{1}{2}$DE) of the other, therefore, their remaining ſides CF, CG (which are the diſtances of the chords from the centre) are equal (17. 1.).

Next let the chord AH be greater than DE; the arch AKH ſhall be greater than DME. Upon the arch AKH take ANB equal to DME; draw the chord AB, and ſuppoſe COF drawn from the centre perpendicular to AB, and CI perpendicular to AH. It is evident that CF$>$CO, and (15. 1.) CO$>$CI; much more then is CF$>$CI; but CF=CG, becauſe the chords AB, DE are equal; therefore CG$>$CI; that is, the chord nearer the centre is greater than that which is farther from it.

THEOREM IX.

Fig. 49. The perpendicular BD, drawn at the extremity of a radius CA, is a tangent to the circle.

FOR any oblique line CE is greater than the perpendicular CA, (15. 1.) therefore the point E is without the circle; therefore the line BD has but one point A common with the circumference, and conſequently it is a tangent to the circle. (Def. 8.).

SCHOLIUM.

Through the ſame point A, only one tangent, AD, can be drawn to the circle. For if it be poſſible to draw another, let AG be that other tangent; draw CF perpendicular to AG; then CF ſhall be leſs than CA, (15. 1.) therefore F muſt be within the circle; and conſequently AF when produced muſt neceſſarily meet the circle in another point beſides A; therefore it cannot be a tangent.

THEOREM X.

Fig. 50. and 51. If BC, the diſtance of the centres of two circles, be leſs than the ſum of their radii; and alſo the greater radius leſs than the ſum of the diſtance of their centres and the leſſer radius; the two circles interſect each other.

FOR that the circles may interſect each other in a point A, it is neceſſary that the triangle ABC be poſſible; therefore, not only muſt CB be leſs than CA +AB, but alſo the greater radius AB muſt be leſs than AC+CB; (7. 1.) and it is evident, that as often as the triangle ABC can be conſtructed, the circumferences deſcribed on the centres B, C, ſhall interſect each other in two points A, D.

THEOREM XI.

Fig. 52. If the diſtance CB of the centres of two circles be equal to the ſum of the radii CA, BA, the circles ſhall touch each other externally. Of the Circle.

IT is evident that they have a common point A; but they cannot have more; for if they had two, then the diſtance of the centres muſt neceſſarily be leſs than the ſum of the radii.

THEOREM XII.

If the diſtance CB of the centres of two circles be equal to the difference of the radii, the two circles ſhall touch each other internally. Fig. 53.

IN the firſt place, it is evident that the point A is common to them both; they cannot, however, have another; for that this may happen, it is neceſſary that the greater radius AB be ſmaller than the ſum of the radius AC and the diſtance CB of the centre, (10.) which is not the caſe.

COR. Therefore, if two circles touch each other, either internally or externally, their centres and the point of contact are in the ſame ſtraight line.

THEOREM XIII.

In the ſame circle, or in equal circles, equal angles ACB, DCE, at the centres, intercept upon the circumference equal arches AB, DE. And, converſely, if the arches AB, DE are equal, the angles ACB, DCE are equal. Fig. 54.

FIRST, if the angle ACB be equal to DCE, the one angle may be applied upon the other; and as the lines containing them are equal, it is manifeſt that the point A will fall upon D, and the point B upon E; thus the arch AB will coincide with, and be equal to the arch DE.

Next, if the arch AB be equal to DE, the angle ACB is equal to DCE; for if the angles are not equal; let ACB be the greater; and let ACI be taken equal to DCE; then, by what has been already demonſtrated, the arch AI=DE; but by hypotheſis AB=DE; therefore, AI=AB which is impoſſible; therefore the angle ACB=DCE.

THEOREM XIV.

The angle BCD at the centre of a circle is double the angle BAD at the circumference, when both ſtand on the ſame arch BD. Fig. 55. Fig. 56.

FIRST let the centre of the circle be within the angle BAD; draw the diameter AE. The exterior angle BCE of the triangle BCA is equal to both the inward and oppoſite angles BAC, CBA; (23.1). but the triangle BCA being iſoſceles, the angle BAC=CBA; therefore the angle BCE is double of the angle BAC. For the ſame reaſon, the angle DCE is double of the angle DAE, therefore the whole angle BCD is double of the whole angle BAD. Fig. 55.

Suppoſe in the next place that the centre is without the angle BAD; then, drawing the diameter AE, it may be demonſtrated, as in the firſt caſe, that the angle ECD is double of the angle EAD, and that the angle Fig. 56.

Of Proportion.

angle ECB, a part of the firſt, is double the angle EAB a part of the other; therefore the remaining angle BCD is double the remaining angle BAD.

Theorem XV.

Fig. 57. Fig. 58. All angles BAD, BFD in the ſame ſegment BAFD of a circle are equal to one another.

Fig. 57. If the ſegment be greater than a ſemicircle, from the centre C draw CB and CD; then the angles BAD and BFD being (by laſt theorem) each equal to half BCD, they muſt be equal to one another.

Fig. 58. But if the ſegment BAFD be leſs than a ſemicircle, let H be the interſection of BF and AD; then, the triangles ABH and FDH having the angle AHB of the one equal to FHD of the other, (4. 1.) and ABH =FDH, (by caſe 1.) will have the remaining angles of the one equal to the remaining angles of the other; that is the angle BAH=HFD, or BAD=BFD.

Theorem XVI.

Fig. 59. The oppoſite angles of any quadrilateral figure ABCD deſcribed in a circle are together equal to two right angles.

Draw the diagonals AC, BD; becauſe the angle ABD=ACD. and CBD=CAD, (laſt theor.) the ſum ABD+CBD=ACD+CAD; or ABC=ACD+CAD; to each of theſe equals add ADC, and ABC+ADC= ACD+CAD+ADC; but the laſt three angles, being the angles of the triangle ADC, are taken together equal to two right angles, (24. 1.) therefore ABC+ADC= two right angles. In the ſame manner, the angles BAD, BCD may be ſhewn to be together equal to two right angles.

Theorem XVII.

Of Proportion.

In a circle, the angle BAD in a ſemicircle is a right angle, but the angle ABD in a ſegment greater than a ſemicircle is leſs than a right angle; and the angle AED in a ſegment leſs than a ſemicircle is greater than a right angle. Fig. 60.

Let C be the centre, join CA, and produce BA to F. Becauſe CB=CA, the angle CAB=CBA; (11. 1.) and becauſe CD=CA, the angle CAD =CDA, therefore the whole angle BAD=CBA +CDA; but theſe two laſt angles are together equal to DAF, (23. 1.) therefore the angle BAD=DAF; and hence each of them is a right angle.

And becauſe ABD+ADB is a right angle, therefore ABD, an angle in a ſegment greater than a ſemicircle, is leſs than a right angle.

And becauſe ABDE is a quadrilateral in a circle, the oppoſite angles B and E are equal to two right angles (laſt theor.), but B is leſs than a right angle; therefore the angle E, which is in a ſegment leſs than a ſemicirele, is greater than a right angle.

Theorem XVIII.

The angle BAC contained by AC, a tangent, and AB, a chord drawn from the point of contact, is equal to any angle ADB in the alternate ſegment of the circle. Fig. 61.

Draw the diameter AE, and join DE. The angles EAC, EDA, being right angles, (laſt theor.) are equal to one another; and of theſe, EAB, a part of the one, is equal to EDB, a part of the other (15.) therefore the remainder, BAC, of the former is equal to the remainder, BDA, of the latter.

SECT. III. OF PROPORTION.

Definitions.

I. When one magnitude contains another a certain number of times exactly, the former is ſaid to be a *multiple* of the latter, and the latter a *part* of the former.

II. When ſeveral magnitudes are multiples of as many others, and each contains its parts the ſame number of times, the former are ſaid to be *equimultiples* of the latter, and the latter *like parts* of the former.

III. Betwixt any two finite magnitudes of the ſame kind there ſubſiſts a certain relation in reſpect to quantity, which is called their *ratio*. The two magnitudes compared are called the *terms* of the ratio, the firſt the *antecedent*, and the ſecond the *conſequent*.

IV. If there be four magnitudes, or quantities, A, B, C, D, and if A contain ſome part of B juſt as often as C contains a like part of D, then, the ratio of A to B is ſaid to be the ſame with (or equal to) the ratio of C to D.

It follows immediately from this definition, that if A contain B juſt as often as C contains D, then the ratio of A to B is equal to the ratio of C to D; for in that caſe it is evident that A will contain any part of B juſt as often as C contains a like part of D.

V. When two ratios are equal, their terms are called *proportionals*.

To denote that the ratio of A to B is equal to the ratio of C to D, they are uſually written thus, A : B :: C : D, or thus, A : B=C : D, which is read thus; A is to B as C to D; ſuch an expreſſion is called an *analogy* or a *proportion*.

VI Of four proportional quantities, the laſt term is called a *fourth proportional* to the other three taken in order.

VII. Three quantities A, B, C, are ſaid to be proportionals, when the ratio of the firſt A to the ſecond B is equal to the ratio of the ſecond B to the third C.

VIII. Of three proportional quantities, the middle term is ſaid to be a *mean proportional* between the other two, and the laſt a *third proportional* to the firſt and ſecond.

IX. Quantities are ſaid to be *continual proportionals*, when the firſt is to the ſecond, as the ſecond to the third, and as the third to the fourth, and ſo on.

X. When there is any number of magnitudes A, B, C, D, of the ſame kind, the ratio of the firſt A to the laſt D is ſaid to be compounded of the ratio of

A

Of Proportion.

A to B, and of the ratio of B to C, and of the ratio of C to D.

XI. If three magnitudes A, B, C, be continual proportionals; that is, if the ratio of A to B be equal to the ratio of B to C; then the ratio of the firſt A to the third C is ſaid to be *duplicate* of the ratio of the firſt A to the ſecond B. Hence, ſince by the laſt definition the ratio of A to C is compounded of the ratio of A to B and of B to C, a ratio which is compounded of two equal ratios is *duplicate* of either of them.

XII. If four magnitudes A, B, C, D be continual proportionals, the ratio of the firſt A to the fourth D is ſaid to be *triplicate* the ratio of the firſt A to the ſecond B. Hence a ratio compounded of three equal ratios is triplicate of any one of them.

XIII. *Ratio of Equality* is that which equal magnitudes bear to each other.

The next four definitions explain the names given by geometers to certain ways of changing either the order or magnitude of proportionals, ſo that they ſtill continue to be proportional.

XIV *Inverſe Ratio* is when the antecedent is made the conſequent, and the conſequent the antecedent. See Theor. 3.

XV. *Alternate* proportion is when antecedent is compared with antecedent, and conſequent with conſequent. See Theor. 2.

XVI. *Compounded* ratio is when the ſum of the antecedent and conſequent is compared either with the antecedent, or with the conſequent. See Theor. 4.

XVII. *Divided* ratio is when the difference of the antecedent and conſequent is compared either with the antecedent or with the conſequent. See Theor. 4.

Axioms.

1. Equal quantities have each the ſame ratio to the ſame quantity; and the ſame quantity has the ſame ratio to each of any number of equal quantities.

2. Quantities having the ſame ratio to one and the ſame quantity, or to equal quantities, are equal among themſelves; and thoſe quantities, to which one and the ſame quantity has the ſame ratio, are equal.

3. Ratios equal to one and the ſame ratio are alſo equal, one to the other.

4. If two quantities be divided into, or compoſed of parts that are equal among themſelves, or all of the ſame magnitude, then will the whole of the one have the ſame ratio to the whole of the other, as the number of parts in the one has to the number of equal parts in the other.

Theorem I.

Equimultiples of any two quantities have to each other the ſame ratio as the quantities themſelves.

Let A and B be any two quantities, and, m being put to denote any number, let m A, m B be equimultiples of thoſe quantities, m A ſhall have to m B the ſame ratio that A has to B.

Let the ratio of A to B be equal to the ratio of one number p to another number q, that is, let A contain p ſuch equal parts as B contains q, (Ax. 4.) then, if x be put for one of thoſe equal parts, we have

$$A = p\,x,\quad B = q\,x,$$

and conſequently, multiplying both by the ſame number m,

$$m\,A = m\,p\,x,\quad m\,B = m\,q\,x,$$

or, which is evidently the ſame,

$$m\,A = p \times m\,x,\quad m\,B = q \times m\,x.$$

Hence it appears that m A contains the quantity $m\,x$ as a part p times; and that m B contains the ſame quantity q times; therefore the ratio of m A to m B is the ſame as the ratio of the number p to the number q (Ax. 4.); but the ratio of A to B is alſo equal to the ratio of p to q, (by hypotheſis), therefore the ratio of m A to m B is equal to the ratio of A to B (Ax. 3).

Cor. Hence like parts of quantities have to each other the ſame ratio as the wholes: that is, $\frac{A}{m} : \frac{B}{m} :: A : B$; for A and B are equimultiples of $\frac{A}{m}$ and $\frac{B}{m}$.

Theorem II.

If four quantities of the ſame kind be proportionals, they ſhall alſo be proportionals by alternation.

Let A, B, C, D be four quantities, of the ſame kind, and let A : B :: C : D; then ſhall A : C :: B : D.

Let the equal ratios of A to B, and of C to D, be the ſame as the ratio of the number p to the number q; then A will contain p ſuch equal parts as B contains q, (Ax. 4.) and C will, in like manner, contain p ſuch equal parts as D contains q; let each of the equal parts thus contained in A and B be x, and let each of thoſe contained in C and D be y, then

$$A = p\,x,\quad B = q\,x,\quad C = p\,y,\quad D = q\,y.$$

Now as $A = p\,x$, and $C = p\,y$; it is manifeſt that A and C are equimultiples of x and y, therefore the ratio of A to C is equal to the ratio of x to y, (1.) and as $B = q\,x$, and $D = q\,y$, B and D are in like manner equimultiples of x and y; therefore the ratio of B to D is equal to the ratio of x to y; therefore the ratio of A to C is equal to the ratio of B to D.

Cor. If the firſt of four proportionals be greater than the third, the ſecond is greater than the fourth; and if the firſt be leſs than the third, the ſecond is leſs than the fourth.

Theorem III.

If four quantities be proportionals, they are alſo proportionals by inverſion.

Let A : B :: C : D; then ſhall B : A :: D : C.

For let the equal ratios of A to B, and of C to D, be the ſame as the ratio of the number p to the number q, then as B will contain q ſuch equal parts as A contains

Of Proportion.

tains p (Ax. 4.), B will be to A as q is to p, and as D will contain q such equal parts as C contains p, D will be to C also as q to p, therefore the ratio of B to A is equal to the ratio of D to C (Ax. 3.).

Theorem IV.

If four quantities be proportionals, they are also proportionals by composition, and by division.

Let A : B :: C : D, then will

A+B : A::C+D : C, and A+B : B :: C+D : D;
also A—B : A :: C—D : D, and A—B : B :: C—D : D.

Let us suppose, as in the two preceding theorems, that the ratios of A to B, and of C to D, are each equal to the ratio of the number p to the number q, so that A contains p such equal parts as B contains q, and C contains p such equal parts as D contains q; and let x as before denote each of the equal parts contained in A and B, and y each of the equal parts contained in C and D; then, since

$$A=px, \quad B=qx, \quad C=py, \quad D=qy,$$
$$\text{therefore } A+B=px+qx=(p+q)x;$$
$$C+D=py+qy=(p+q)y.$$

Now as A+B contains x $p+q$ times, and A contains the same quantity p times, and B contains it q times, (by the 4th axiom),

$$A+B : A :: p+q : p, \text{ and } A+B : B :: p+q : q,$$

and as C+D contains y $p+q$ times, and C contains it p times, and D contains it q times.

$$C+D : C :: p+q : p, \text{ and } C+D : D :: p+q : q.$$

Thus it appears that the ratios of A+B to A, and of C+D to C, are equal to the same ratio, namely, that of $p+q$ to p; therefore (Ax. 3.) A+B : A :: C+D : C. It also appears that the ratios of A+B to B, and C+D to D are each equal to the ratio of $p+q$ to q; therefore (Ax. 3.) A+B : B :: C+D : D.

In the same manner the second part of the theorem may be proved, namely, that

A—B : A :: C—D : C and A—B : B :: C—D : D.

Theorem V.

If four quantities be proportionals, and there be taken any equimultiples of the antecedents, and also any equimultiples of the consequents; the resulting quantities will still be proportionals.

Let A : B :: C : D, and m A, m C be any equimultiples of the antecedents, and n B, n D any equimultiples of the consequents; then m A : n B :: m C : n D.

The quantities p, q, x and y being supposed to express the same things as in the foregoing theorems; because

$$A=px, \quad B=qx, \quad C=py, \quad D=qy,$$

therefore, multiplying the antecedents by the number m, and the consequents by n,

$$m\,A=mpx, \quad n\,B=nqx,$$
$$m\,C=mpy, \quad n\,D=nqy,$$

and hence the ratio of m A to n B is equal to the ratio of the number mp to the number nq, (Ax. 4.) and the ratio of m C to n D, is equal to the same ratio of mp to nq, therefore (Ax. 3.) m A : n B :: m C : n D.

Theorem VI.

If there be any number of quantities, and as many others, which, taken two and two, have the same ratio; the first shall have to the last of the first series the same ratio which the first of the other series has to the last.

First, let there be three quantities A, B, C, and other three H, K, L, and let A : B :: H : K, and B : C :: K : L, then will A : C :: H : L.

A, B, C,
H, K, L

For let the equal ratios of A to B, and of H to K, be the same with the ratio of a number p to another number q, so that x and y being like parts of A and H, and also like parts of B and K, as in the former theorems,

$$A=px, \quad B=qx, \quad H=py, \quad K=qy.$$

Also let C contain q equal parts, each equal to v, and let L contain q equal parts, each equal to z, so that

$$C=qv, \quad L=qz,$$

then because B : C :: K : L, that is, $qx : qv :: qy : qz$, and qx and qv are equimultiples of x and v, also qy and qz are equimultiples of y and z, therefore (1. & Ax. 3.) $x : v :: y : z$, hence (by last theorem) $px : qv :: py : qz$, that is, (because $A=px$, $C=qv$, $H=py$, $L=qz$) A : C :: H : L.

Next, let these four quantities, A, B, C, D, and other four H, K, L, M, such, that A : B :: H : K, and B : C :: K : L, and C : D :: L : M, then will A : D :: H : M.

A, B, C, D,
H, K, L, M.

For, because A : B :: H : K, and B : C :: K : L; therefore, by the first case, A : C :: H : L; and because C : D :: L : M, therefore, by the same case, A : D :: H : M. The demonstration applies in the same manner to any number of quantities.

Cor. Hence it appears, that ratios compounded of the same number of like or equal ratios are equal to one another.

Note.—When four quantities are proportionals in the manner explained in this theorem, they are said to be so from *equality of distance*; and it is usual for mathematical writers to say that they are so, *ex æquali* or *ex æquo*.

Theorem VII.

If there be any number of quantities, and as many others, which taken two and two in a cross order have the same ratio; the first shall have to the last of the first series the same ratio which the first has to the last of the other series.

First,

Proportions of Figures.

FIRST, let there be three quantities A, B, C, and other three H, K, L, ſuch that A : B :: K : L, and B : C :: H : K; then will A : C :: H : L. [A, B, C, H, K, L.]

For let the equal ratios of A to B, and of K to L be equal to the ratio of the number p to the number q, ſo that as before

$$A=p\,x,\quad B=q\,x,\quad K=p\,y,\quad L=q\,y.$$

Alſo, let C be ſuppoſed to contain q equal parts, each equal to z, and let H contain p equal parts, each equal to v, ſo that

$$C=q\,z,\quad H=p\,v;$$

Then, becauſe B : C :: H : K, that is, $q\,x : q\,z :: p\,v : p\,y$; therefore (1. & Ax. 3.) $x : z :: v : y$, and conſequently (5.) $p\,x : q\,z :: p\,v : q\,y$, that is (becauſe $p\,x=A$, $q\,z=C$, $p\,v=H$, $q\,y=L$) A : C :: H : L.

Next, let there be four quantities A, B, C, D, and other four H, K, L, M, ſuch, that A : B :: L : M, and B : C :: K : L, and C : D :: H : K, then will A : D :: H : M; for becauſe A : B :: L : M, and B : C :: K : L; by the foregoing caſe A : C :: K : M; and again becauſe C : D :: H : K; therefore, by ſame caſe, A : D :: H : M. The demonſtration applies in the ſame manner to any number of quantities. [A, B, C, D, H, K, L, M.]

Note.—In this theorem, as in the laſt, the four quantities A, D, H, M, are ſaid to be proportionals from *equality of diſtance;* but becauſe in this caſe the proportions are taken in a croſs order, it is common to ſay, that they are ſo, *ex æquali, in proportione perturbata*, or *ex æquo inverſe/y.*

THEOREM VIII.

If to the two conſequents of four proportionals there be added any two quantities that have the ſame ratio to the reſpective antecedents, theſe ſums and the antecedents will ſtill be proportionals.

LET A : B :: C : D
and A : B′ :: C : D′

(where B′ and D′ denote two quantities diſtinct from thoſe denoted by B and D); then will

$$A : B+B' :: C : D+D'.$$

For ſince A : B :: C : D, by inverſion, (3.) B : A :: D : C, but A : B′ :: C : D′, therefore (6.) B : B′ :: D : D′, and by compoſition, (4.) and inverſion B : B+B′ :: D : D+D′, and ſince A : B :: C : D; therefore (6.) A : B+B′ :: C : D+D′.

COR. 1. If inſtead of two quantities B′, D′, there be any number B′, B″, &c. and D′, D″, &c. which taken two and two have the ſame ratio to the antecedents A, C, that is, if

Proportions of Figures.

$$A : B :: C : D,$$
$$A : B' :: C : D',$$
$$A : B'' :: C : D'';$$

then will $A : B+B'+B'' :: C : C+D'+D''$.

For ſince A : B+B′ :: C : D+D′ (by the theor.)
and A : B″ :: C : D″,

therefore, by the propoſition,

$$A : B+B'+B'' :: C : D+D'+D''.$$

COR. 2. If any number of quantities of the ſame kind be proportionals, as one of the antecedents is to its conſequent, ſo is the ſum of all the antecedents to the ſum of all the conſequents.

Let A : B :: C : D :: E : F,

then becauſe A : A :: B : B,
and A : C :: B : D,
and A : E :: B : F;

therefore, A : A+C+E :: B : B+D+F; and by alternation,

$$A : B :: A+C+E : B+D+F.$$

In treating of proportion we have ſuppoſed that the antecedent contains ſome part of the conſequent a certain number of times exactly, which part is therefore a common meaſure of the antecedent and conſequent. But there are quantities which cannot have a common meaſure, and which are therefore ſaid to be *incommenſurable;* ſuch, for example, are the ſides of two ſquares, one of which has its ſurface double that of the other.

Although the ratio of two incommenſurable quantities cannot be expreſſed in numbers, yet we can always aſſign a ratio in numbers which ſhall be as near to that ratio as we pleaſe. For let A and B be any two quantities whatever, and ſuppoſe that x is ſuch a part of A that $A=p\,x$; then if q denote the number of times that x can be taken from B, and d the remainder, we have $B=q\,x+d$, and $q\,x=B-d$; and becauſe $p : q :: p\,x : q\,x$, therefore $p : q :: A : B-d$. Now as d is leſs than x, by taking x ſufficiently ſmall d may be leſs than any propoſed quantity, ſo that $B-d$ may differ from B by leſs than any given quantity; therefore two numbers p and q may always be aſſigned, ſuch, that the ratio of p to q ſhall be the ſame as the ratio of A to a quantity that differs leſs from B than by any given quantity, however ſmall that quantity may be.

Hence we may conclude, that whatever has been delivered in this ſection relating to commenſurable quantities, may be conſidered as applying equally to ſuch as are incommenſurable.

SECT. IV. THE PROPORTIONS OF FIGURES.

DEFINITIONS.

I. *Equivalent Figures* are ſuch as have equal ſurfaces.

Two figures may be equivalent, although very diſſimilar; thus a circle may be equivalent to a ſquare, a triangle to a rectangle, and ſo of other figures.

We ſhall give the denomination of *equal* figures to

Proportions of Figures.

those which, being applied the one upon the other, coincide entirely; thus, two circles having the same radius are equal; and two triangles having three sides of the one equal to three sides of the other, each to each, are all equal.

II. Two figures are *similar*, when the angles of the one are equal to the angles of the other, each to each; and the *homologous* sides proportionals. The homologous sides are those which have the same position in the two figures; or which are adjacent to the equal angles. The angles themselves are called *homologous angles*.

Two equal figures are always similar, but similar figures may be very unequal.

III. In two different circles, *similar sectors*, *similar arches*, *similar segments*, are such as correspond to equal angles at the centre. Thus the angle A being equal to the angle O, the arch BC is similar to the arch DE, and the sector ABC to the sector ODE, &c.

Fig. 62.

Fig. 63. Plate CCXLII.

IV. The *Altitude of a parallelogram* is the perpendicular which measures the distance between the opposite sides or bases AB, CD.

Fig. 64.

V. The *Altitude of a triangle* is the perpendicular AD drawn from the vertical angle A upon the base BC.

Fig. 65.

VI. The *Altitude of a trapezoid* is the perpendicular EF drawn between its two parallel bases AB, CD.

VII. The *Area* and the surface of a figure are terms of nearly the same signification. The term *area*, however, is more particularly used to denote the superficial quantity of the figure in respect of its being measured, or compared with other surfaces.

Theorem I.

Fig. 66. **Parallelograms which have equal bases and equal altitudes are equivalent.**

Let AB be the common base of the parallelograms ABCD, EB F, which being supposed to have the same altitude, the sides DC, FE opposite to the bases will lie in DE a line parallel to AB. Now, from the nature of a parallelogram, AD=BC, and AF=BE; for the same reason DC=AB, and FE=AB; therefore, DC=FE, and taking away DC and FE from the same line DE, the remainders CE and DF are equal; hence the triangles DAF, CBE have three sides of the one equal to three sides of the other, each to each; and consequently are equal (10. 1.). Now if from the quadrilateral ABED, the triangle ADF be taken away, there will remain the parallelogram ABEF; and if from the same quadrilateral ABED, the triangle CBE, equal to the former, be taken away, there will remain the parallelogram ABCD; therefore the two parallelograms ABCD, ABEF, which have the same base, and the same altitude, are equivalent.

Cor. Every parallelogram is equivalent to a rectangle of the same base and altitude.

Theorem II.

Fig. 67. **Every triangle ABC is the half of a parallelogram ABCD, having the same base and altitude.**

For the triangles ABC, ACD are equal (28. 1.).

Cor. 1. Therefore a triangle ABC is the half of a rectangle BCEF of the same base and altitude.

Cor. 2. All triangles having equal bases, and equal altitudes, are equivalent. Proportions of Figures.

Theorem III.

Two rectangles of the same altitude are to each other as their bases. Fig. 68.

Let ABCD, AEFD be two rectangles, which have a common altitude AD; the rectangle ABCD shall have to the rectangle AEFD the same ratio that the base AB has to the base AE.

Let the base AB have to the base AE the ratio of the number p (which we shall suppose 7.) to the number q (which may be 4.) that is, let AB contain p (7.) such equal parts as AE contains q (4.), then, if perpendiculars be drawn to AB and AE at the points of division, the rectangles ABCD and AEFD will be divided, the former into p, and the latter into q rectangles, which will be all equal (1.) for they have equal bases, and the same altitude; thus the rectangle ABCD will also contain p such equal parts as the rectangle AEFD contains q; therefore the rectangle ABCD is to AEFD as the number p to the number q (Ax. 4. 3.), that is, as the base AB to AE.

Theorem IV.

Any two rectangles are to each other as the products of any numbers proportional to their sides. Fig. 71.

Let the numbers m, n, p, q, have among themselves the same ratios that the sides of the rectangles ABCD, AEFG have to each other; that is, let AB contain m such equal parts, whereof AD contains n, and AE contains p, and AF contains q; then shall ABCD : AEFG :: $mn : pq$.

Let the rectangles be so placed that the sides AB, AE may be in a straight line, then AD and AG will also lie in a straight line (3. 1.). Now (3.)

ABCD : AEHD :: AB : AE :: $m : p$,

but $m : p :: nm : np$, (1. 3.)

therefore ABCD : AEHD :: $nm : np$.

Again, AEHD : AEFG :: AD : AG :: $n : q$;

but $n : q :: pn : pq$;

therefore, AEHD : AEFG :: $pn : pq$;

and it was shewn that

ABCD : AEHD :: $nm : np$ or pn,

therefore, (6. 3.) ABCD : AEFG :: $mn : pq$.

Scholium.

Hence it appears, that the product of the base by the altitude of a rectangle may be taken for its measure, observing that by such product is meant that of the number of linear units in the base by the number of linear units in the altitude. This measure is however not absolute, but relative, for it must be supposed, that in comparing one rectangle with another, the sides of both are measured by the same linear unit. For example, if the base of a rectangle A be three units, and its altitude 10, the rectangle is represented by 3×10 or 30; this number considered by itself has no

Proportions of Figures.

meaning, but if we have a second rectangle B, the base of which is twelve units, and altitude seven, this second rectangle shall be represented by the number 12×7 or 84, and hence it may be concluded that the two rectangles are to each other as 30 to 84; therefore, if in estimating any superficies the rectangle A be taken for the measuring unit, the rectangle B shall have for its absolute measure $\frac{84}{30}$, that is, it shall be $\frac{84}{30}$ superficial units.

It is more common, as well as more simple, to take for a superficial unit a square, the side of which is an unit in length; and then the measure which we have regarded only as relative becomes absolute; for example the number 30, which is the measure of the rectangle A, represents 30 superficial units or 30 squares, each having its side equal to an unit. To illustrate this, see fig. 72.

Theorem V.

Fig. 67. The area of any parallelogram is equal to the product of its base by its altitude.

For the parallelogram ABCD is equivalent to the rectangle FBCE, which has the same base BC, and the same altitude AO (Cor. 1.); but the measure of the rectangle is $BC \times AO$, (4.) therefore the area of the parallelogram is $BC \times AO$.

Cor. Parallelograms having the same base, or equal bases, are to each other as their altitudes; and parallelograms having the same altitude are to each other as their bases; for in the former case put B for the common base and A and A′ for the altitudes, then the areas of the figures are $B \times A$ and $B \times A'$; and it is manifest that $B \times A : B \times A' :: A : A'$; and in the latter case, putting A for the common altitude, and B and B′ for the bases, it is evident that $B \times A : B' \times A :: B : B'$.

Theorem VI.

Fig. 67. The area of a triangle is equal to the product of its base by the half of its altitude.

For the triangle ABC is half of the parallelogram ABCD, which has the same base BC, and the same altitude AO (2.), but the area of the parallelogram is $BC \times AO$ (5.), therefore that of the triangle is $\frac{1}{2}$ BC $\times$ AO, or $BC \times \frac{1}{2}$ AO.

Cor. Two triangles of the same altitude are to each other as their bases; and two triangles having the same base are to each other as their altitudes.

Theorem VII.

Fig. 73. The area of a trapezoid ABCD is equal to the product of its altitude EF by half the sum of its parallel sides AB, CD.

Through the point I, the middle of BC, draw KL parallel to the opposite side AD, and produce DC to meet KL. In the triangles IBL, ICK, IB is equal to IC by construction, and the angle CIK=BIL, and the angle ICK=IBL (21. 1.) therefore these triangles are equal; and hence the trapezoid ABCD is equivalent to the parallelogram ALKD, and has for its measure $AL \times EF$. But AL=DK, and because the triangle IBL is equal to the triangle KCI, the side BL=CK, therefore AB+CD=AL+DK=2AL; hence AL is half the sum of the parallel sides AB, CD; and as the area of the trapezoid is equal to $FE \times AL$, it is also equal to $FE \times \left(\frac{AB+CD}{2}\right)$.

Proportions of Figures.

Theorem VIII.

If four straight lines AB, AC, AD, AE, be proportionals; the rectangle ABFE, contained by the two extremes, is equivalent to the rectangle ACGD contained by the means. And conversely, if the rectangle contained by AB, AE, the extremes, be equivalent to the rectangle contained by AC, AD the means, the four lines are proportionals. Fig. 69.

Let the rectangles be so placed as to have the common angle A, and let BF, DG intersect each other in H. Because the rectangles ABHD, ACGD have the same altitude AD,

ABHD : ACGD :: AB : AC; (3.),

and because the rectangles ABHD, ABFE have the same altitude AB, for the same reason

ABHD : ABFE :: AD : AE;

but by hypothesis AB : AC :: AD : AE, therefore (Ax. 3. 3.) ABHD : ACGD :: ABHD : ABFE, therefore (Ax. 2. 3.) the rectagle ACGD=ABFE.

Next suppose that the rectangle ACGD=ABFE; then ABHD : ACGD :: ABHD : ABFE, (Ax. 1. 3.) but ABHD : ACGD :: AB : AC, (3.) and ABHD : ABFE :: AD : AE, therefore AB : AC :: AD : AE.

Cor. If three straight lines be proportionals, the rectangle contained by the extremes is equal to the square of the mean; and if the rectangle contained by the extremes be equal to the square of the mean, the three straight lines are proportionals.

Theorem IX.

If four straight lines be proportionals, and also other four, the rectangles contained by the corresponding terms shall be proportionals; that is, if AB : BC :: CD : DE, and BF : BG :: DH : DI, then shall *rectangle* AF : *rect.* BM :: *rect.* CH : *rect.* DQ. Fig. 70.

For in BG and DI, produced if necessary, take BF=BF, and DH=DH, and let FP be parallel to BC, and HN to DE; then (3.)

rect. AF : *rect.* BP :: AB : BC,
and *rect.* CH : *rect.* DN :: CD : DE;

but AB : BC :: CD : DE, (by hypothesis) therefore,

rect. AF : *rect.* BP :: *rect.* CH : *rect.* DN;

now (3.) *rect.* BP : *rect.* BM :: BF : BG, and *rect.* DN : *rect.* DQ :: DH : DI; but BF : BG :: DH : DI, (by hypoth.) therefore,

rect. BP : *rect.* BM :: *rect.* DN : *rect.* DQ;

but

Proportions of Figures.

but it has been ſhewn that

rect. AF : *rect.* BP :: *rect.* CH : *rect.* DN,

therefore (6. 3.)

rect. AF : *rect.* BM :: *rect.* CH : *rect.* DQ.

Cor. Hence the ſquares of four proportional ſtraight lines are themſelves proportionals.

Theorem X.

Fig. 74. If a ſtraight line AC be divided into any two parts at B, the ſquare made upon the whole line AC ſhall be equal to the ſquares made upon the two parts AB, BC, together with twice the rectangle contained by thoſe two parts: which may be expreſſed thus, $AC^2=AB^2+BC^2+2AB\times BC$.

Suppose the ſquare ACDE to be conſtructed; take AF=AB, draw FG parallel to AC, and BH parallel to CD.

The ſquare ACDE is made up of four parts; the firſt ABIF is the ſquare upon AB, becauſe AF=AB; the ſecond IGDH is the ſquare upon BC, for AC=AE, and AB=AF, therefore AC—AB=AE—AF, that is BC=EF; but BC=IG, and EF=DG, (26. 1.) therefore IGDH is the ſquare upon BC, and the remaining two parts are the two rectangles BCGI, FEHI, which have each for their meaſure AB×BC, therefore the ſquare upon AC is equal to the ſquares upon AB and BC, and twice the rectangle AB×BC.

Theorem XI.

Fig. 75. If a ſtraight line AC be the difference of two ſtraight lines AB, BC; the ſquare made upon AC ſhall be equal to the exceſs of the two ſquares upon AB and BC above twice the rectangle contained by AB and BC; that is,

$$AC^2=AB^2+BC^2-2AB\times BC.$$

Construct the ſquare ABIF, take AE=AC, and draw CG parallel to BI, and HK parallel to AB; and complete the ſquare EFLK. The two rectangles CBIG, GLKD have each AB×BC for their meaſure; and if theſe be taken from the whole figure ABILKEA, that is from AB^2+BC^2, there will remain the ſquare ACDE, that is, the ſquare upon AC.

Theorem XII.

Fig 76. The rectangle contained by the ſum and the difference of two ſtraight lines is equal to the difference of the ſquares upon thoſe lines; that is

$$(AB+BC)\times(AB-BC)=AB^2-BC^2.$$

Construct upon AB and AC the ſquares ABIF, ACDE; produce AB, ſo that BK=BC, and complete the rectangle AKLE. The baſe AK of the rectangle is the ſum of the two lines AB, BC; and its altitude AE is the difference of the ſame lines; therefore, the rectangle AKLE=(AB+BC) (AB—BC); but the ſame rectangle is compoſed of two parts ABHE+BHLK, of which, BHLK is equal to the rectangle EDGF, for BH=DE, and BK=FE; therefore, AKLE= ABHE+EDGF; but theſe two parts conſtitute the exceſs of the ſquare ABIF above the ſquare DHIG, the former of which is the ſquare upon AB, and the latter the ſquare upon BC, therefore (AB+BC)× (AB—BC)=AB^2-BC^2.

Proportions of Figures.

Theorem XIII.

The ſquare upon the hypothenuſe of a right-angled triangle is equal to the ſum of the ſquares upon the two other ſides. Fig. 77.

Let ABC be a right-angled triangle; having formed the ſquares upon its three ſides, draw a perpendicular AD from the right angle upon the hypothenuſe, and produce it to E, and draw the diagonals AF, CH. The angle ABF is evidently the ſum of ABC and a right angle, and the angle HBC is alſo the ſum of ABC and a right angle; therefore the angle ABF= HBC; now AB=BH, for they are ſides of the ſame ſquare, and BC=BF for the ſame reaſon, therefore the triangles ABF, HBC have two ſides, and the included angle of the one equal to two ſides and the included angle of the other, each to each, therefore the triangles are equal (5. 1.) but the triangle ABF is the half of the rectangle BDEF (which for brevity's ſake we ſhall call BE) becauſe it has the ſame baſe BF, and the ſame altitude BD, (2.) and the triangle HBC is in like manner half of the ſquare AH, for the angles BAC, BAL being both right angles, CA and AL conſtitute a ſtraight line parallel to BH, (3. 1.) and thus the triangle HBC, and the ſquare AH have the ſame baſe HB, and the ſame altitude AB; from which it follows that the triangle is half of the ſquare (2.). It has now been proved that the triangle ABF is equal to the triangle HBC; and that the rectangle BE is double of the former, and the ſquare AH double of the latter; therefore the rectangle BE is equal to the ſquare AH. It may be demonſtrated in like manner that the rectangle CDEG, or CE, is equal to the ſquare AI; but the rectangles BE, CE make up the ſquare BCGF, therefore the ſquare BCGF upon the hypothenuſe is equal to the ſquares ALHB, AKIC upon the other two ſides.

Theorem XIV.

In a triangle ABC, if the angle C is acute, the ſquare of the oppoſite ſide AB is leſs than the ſquares of the ſides which contain the angle C; and if AD a perpendicular be drawn to BC from the oppoſite angle, the difference ſhall be equal to twice the rectangle BC×CD; that is, Fig. 78.

$$AB^2=AC^2+CB^2-2BC\times CD.$$

First. Suppoſe AD to fall within the triangle, then BD=BC—CD, and conſequently (11.) $BD^2=BC^2+CD^2-2BC\times CD$; to each of theſe equals add AD^2; then, obſerving that $BD^2+DA^2=BA^2$, and $CD^2+DA^2=CA^2$,

$$AB^2=BC^2+CA^2-2BC\times CD.$$

Next, ſuppoſe AD to fall without the triangle, ſo that BD=CD—BC, and therefore $BD^2=CD^2+BC^2-2BC\times CD$, (11.) to each of theſe add AD^2 as before,

Proportions of Figures.

before, and we get

$$AB^2=BC^2+CA^2-2\,BC\times CD.$$

THEOREM XV.

Fig. 79. In a triangle ABC, if the angle C is obtuſe, the ſquare of the oppoſite ſide AB is greater than the ſum of the ſquares of the ſides which contain the angle C; and if AD a perpendicular be drawn to BC from the oppoſite angle, the difference ſhall be equal to twice the rectangle $BC\times CD$, that is,

$$AB^2=AC^2+BC^2+2\,BC\times CD.$$

FOR $BD=BC+CD$, and therefore (10.) $BD^2=BC^2+CD^2+2BC\times CD$; to each of theſe equals add AD^2, then, obſerving that $AD^2+DB^2=AB^2$, and $AD^2+DC^2=AC^2$,

$$AB^2=BC^2+CA^2+2\,BC\times CD.$$

SCHOLIUM.

It is only when a triangle has one of its angles a right angle, that the ſum of the ſquares of two of its ſides can be equal to the ſquare of the third ſide; for if the angle contained by thoſe ſides be acute, the ſum of their ſquares is greater than the ſquare of the oppoſite ſide, and if the angle be obtuſe, that ſum is leſs than the ſquare of the oppoſite ſide.

THEOREM XVI.

Fig. 80. If a ſtraight line AE be drawn from the vertex of any triangle ABC to the middle of its baſe BC; the ſum of the ſquares of the ſides is equal to twice the ſquare of half the baſe, and twice the ſquare of the line drawn from the vertex to the middle of the baſe; that is, $AB^2+AC^2=2\,BE^2+2\,AE^2$;

DRAW AD perpendicular to BC, then

$$AB^2=BE^2+EA^2-2\,BE\times ED, \text{ (14.)}$$

$$\text{and } AC^2=CE^2+EA^2+2\,CE\times ED, \text{ (15.)}$$

therefore, by adding equals to equals, and obſerving that $BE=CE$, and therefore $BE^2=CE^2$, and $2\,BE\times ED=2\,CE\times ED$,

$$AB^2+AC^2=2\,BE^2+2\,AE^2.$$

THEOREM XVII.

Fig. 81. A ſtraight line DE drawn parallel to one of the ſides of a triangle ABC divides the other two ſides AB, AC proportionally, ſo that AD : DB :: AE : EC.

JOIN BE and CD. The triangles BDE, CDE, having the ſame baſe DE, and the ſame altitude, are equivalent, (2.) and the triangles ADE, BDE, having the ſame altitude, are to one another as their baſes, (6.) that is, ADE : BDE :: AD : DB; the triangles ADE, CDE, having alſo the ſame altitude, are to one another as their baſes; that is, ADE : CDE :: AE : EC, but the triangle BDE has been proved equal to CDE; therefore, becauſe of the common ratio in the two proportions, we have (Ax. 3 3.)

Proportions of Figures.

AD : DB :: AE : EC.

COR. Hence by compoſition AB : AD :: AC : AE; and AB : BD :: AC : CE.

THEOREM XVII.

Converſely, if two of the ſides AB, AC of a triangle are divided proportionally by the ſtraight line DE, ſo that AD : DB :: AE : EC, then ſhall the line DE be parallel to the remaining ſide BC. Fig. 81.

FOR if DE is not parallel to BC, ſuppoſe ſome other line DO to be parallel to BC; then, AB : BD :: AC : CO (17.); and ſince by hypotheſis AD : DB :: AE : EC, and conſequently, by compoſition, AE : BD :: AC : CE, therefore, AC : CO :: AC : CE; therefore, CO=CE (2 Ax. 3.) which is impoſſible; therefore DO is not parallel to BC.

COR. If it be ſuppoſed that BA : AD :: CA : AE, ſtill DE will be parallel to BC; for by diviſion BD : AD :: CE : AE, this proportion being the ſame as in the Theorem, the concluſion muſt be the ſame.

THEOREM XIX.

A ſtraight line AD, which biſects the angle BAC of a triangle, divides the baſe BC into two ſegments proportional to the adjacent ſides BA, AC; that is, BD : DC :: BA : AC. Fig. 82.

THROUGH the point C draw CE parallel to AD, ſo as to meet BA produced. In the triangle BCE, the line AD is parallel to one of its ſides CE, therefore BD : DC :: BA : AE; now the triangle CAE is iſoſceles, for, becauſe of the parallels AD, CE, the angle ACE=DAC, and the angle AEC=BAD, (21. 1.) but by hypotheſis DAC=BAD; therefore ACE=AEC; and conſequently AE=AC, (12. 1.) therefore, ſubſtituting AC inſtead of AE in the above proportion, it becomes BD : DC :: BA : AC.

THEOREM XX.

If two triangles be equiangular, their homologous ſides are proportional, and the triangles are ſimilar. Fig. 84.

LET ABC, CDE be two equiangular triangles, which have the angle BAC=CDE, ABC=DCE, and ACB=DEC; the homologous ſides, or the ſides adjacent to the equal angles, ſhall be proportional; that is, BC : CE :: AB : CD :: AC : DE.

Place the homologous ſides BC, CE in the ſame direction, and produce the ſides BA, ED, till they meet in F. Becauſe BCE is a ſtraight line, and the angle BCA is equal to CED, the lines CA, EF are parallel, (22. 1.) and in like manner, becauſe the angle ABC=DCE, the lines BF, CD are parallel; therefore the figure ACDF is a parallelogram, and hence AF=CD, and CA=DF (26. 1.). In the triangle BFE the line AC is parallel to the ſide FE, therefore

BC :

BC : CE :: BA : AF; or since AF=CD, BC : CE :: BA : CD. Again, in the same triangle, because CD is parallel to the side BF, BC : CE :: FD : DE, or, since FD=AC, BC : CE :: AC : DE; having now shewn that BC : CE :: BA : CD, and that BC : CE :: AC : DE, it follows that BA : CD :: AC : DE; therefore the equiangular triangles BAC, CDE have their homologous sides proportional, and hence (def. 2.) the triangles are similar.

SCHOLIUM.

It is manifest, that the homologous sides are opposite to the equal angles.

THEOREM XXI.

Fig. 83. If two triangles have their homologous sides proportional, they are equiangular and similar.

SUPPOSE that BC : EF :: AB : DE :: AC : DF; then shall A=D, B=E, C=F. At the point E make the angle FEG=B, and at the point F make EFG=C; then the third angle G shall be equal to the third angle A, and the two triangles ABC, GEF shall be equiangular; therefore, by the last theorem BC : EF :: AB : GE; but by hypothesis BC : EF :: AB : DE, therefore GE=DE (Ax. 2. 3.). In like manner, because by the same theorem BC : EF :: CA : FG; and by hypothesis BC : EF :: CA : FD; therefore FG=FD; but it was shewn that EG=ED, therefore, the triangles GEF, DEF, having the sides of the one equal to those of the other, each to each, are equal, but, by construction, the triangle GEF is equiangular to ABC, therefore also the triangles DEF, ABC are equiangular and similar.

THEOREM XXII.

Fig. 85. Two triangles which have an angle of the one equal to an angle of the other, and the sides about these angles proportional, are similar.

LET the angle A=D, and let AB : DE :: AC : DF, the triangle ABC is similar to DEF. Take AG=DE, and draw GH parallel to BC, then the angle AGH=ABC, (21. 1.) therefore the triangle AGH is equiangular to ABC, and consequently (20.) AB : AG :: AC : AH; but by hypothesis AB : DE :: AC : DF, and by construction AG=DE, therefore AH=DF; the two triangles AGH, DEF are therefore equal, (5. 1.) but the triangle AGH is similar to ABC, therefore DEF is similar to ABC.

THEOREM XXIII.

Fig. 86. In a right-angled triangle, if a perpendicular AD be drawn from the right angle upon the hypothenuse, then,

1. The triangles ABD, CAD on each side of the perpendicular are similar to the whole triangle BAC, and to one another.
2. Each side AB or AC is a mean proportional between the hypothenuse BC, and the adjacent segment BD or DC.
3. The perpendicular AD is a mean proportional between the two segments BD, DC.

1. THE triangles BAD, BAC have the common angle B; besides, the right angle BAC is equal to the right angle BDA, therefore the third angle BAD of the one, is equal to the third angle BCA of the other; therefore, these triangles are equiangular and similar; and in the same manner it may be shewn, that the triangle DAC is equiangular and similar to BAC; therefore the three triangles are equiangular and similar to each other.

2. Because the triangle BAD is similar to the triangle BAC, their homologous sides are proportional. Now the side BD of the lesser triangle is homologous to the side BA of the greater, because they are opposite to the equal angles BAD, BCA; in like manner BA, considered as a side of the lesser triangle, is homologous to the side BC of the greater, each being opposite to a right angle; therefore, BD : BA :: BA : BC. In the same manner it may be shewn that CD : CA :: CA : CB, therefore each side is a mean proportional between the hypothenuse and the segment adjacent to that side.

3. By comparing the homologous sides of the two similar triangles ABD, ACD, it appears that BD : DA :: DA : DC; therefore the perpendicular is a mean proportional between the segments of the hypothenuse.

THEOREM XXIV.

Two triangles, which have an angle of the one equal to an angle of the other, are to each other as the rectangles of the sides which contain the equal angles; that is, the triangle ABC is to the triangle ADE, as the rectangle AB×AC to the rectangle AD×AE. Fig. 87.

JOIN BE; because the triangles ABE, ADE have a common vertex E, they have the same altitude, therefore ABE : ADE :: AB : AD, (Cor. to 6.); but AB : AD :: AB×AE : AD×AE, (3.) therefore,

ABE : ADE :: AB×AE : AD×AE.

In the same manner it may be demonstrated that

ABC : ABE :: AB×AC : AB×AE;

Therefore (6. 3.) ABC : ADE :: AB×AC : AD×AE.

COR. Therefore the two triangles are equivalent, if the rectangle AB×AC=AD×AE, or (8.) if AB : AD :: AE : AC, in which case, the sides about the equal angles are said to be *reciprocally* proportional.

SCHOLIUM.

What has been proved of triangles is also true of parallelograms, they being the doubles of such triangles.

THEOREM XXV.

Two similar triangles are to each other as the squares of their homologous sides. Fig. 85.

LET

Proportions of Figures.

Let the angle A=D, the angle B=E, and therefore the angle C=F,

then (20.) AB : DE :: AC : DF;

now AB : DE :: AB : DE,

for the two ratios are identical, therefore (9.)

$AB^2 : DE^2 :: AB \times AC : DE \times DF$;

but ABC : DEF :: AB×AC : DE×DF, (24.)

therefore ABC : DEF :: $AB^2 : DE^2$, (Ax. 3. 3.)

therefore the two ſimilar triangles ABC, DEF, are to each other as the ſquares of the homologous ſides AB, DE, or as the ſquares of any of the other homologous ſides.

Theorem XXVI.

Fig. 89. Similar polygons are compoſed of the ſame number of triangles which are ſimilar and ſimilarly ſituated.

In the polygon ABCDE, draw from one of the angles A the diagonals AC, AD to all the other angles. In the polygon FGHIK, draw in like manner from the angle F, homologous to A, the diagonals FH, FI to the other angles.

Becauſe the polygons are ſimilar, the angle ABC is equal to its homologous angle FGH (Def. 2.) alſo the ſides AB, BC are proportional to FG, GH, ſo that AB : FG :: BC : GH, therefore the triangles ABC, FGH are ſimilar (22.); therefore the angle BCA=GHF, and theſe being taken from the equal angles BCD, GHI, the remainders ACD, FHI are equal; but the triangles ABC, FGH being ſimilar, AC : FH :: BC : GH, beſides, becauſe of the ſimilarity of the polygons, BC : GH :: CD : HI; therefore AC : FH :: CD : HI; now it has been already ſhewn that the angle ACD=FHI, therefore the triangles ACD, FHI are ſimilar (22.). It may be demonſtrated in the ſame manner that the remaining triangles are ſimilar, whatever be the number of ſides of the polygon; therefore two ſimilar polygons are compoſed of the ſame number of triangles, ſimilar to each other, and ſimilarly ſituated.

Theorem XXVII.

Fig. 89. The perimeters of ſimilar polygons are as the homologous ſides, and the polygons themſelves are as the ſquares of the homologous ſides.

For, ſince by the nature of ſimilar figures AB : FG :: BC : GH :: CD : HI, &c. therefore, (2. cor. 8. 3.) AB+BC+CD, &c. the perimeter of the firſt figure, is to FG+GH+HI, &c. the perimeter of the ſecond, as the ſide AB to its homologous ſide FG.

Again, becauſe the triangles ABC, FGH are ſimilar, ABC : FGH :: $AC^2 : FH^2$ (25.), in like manner ACD : FHI :: $AC^2 : FH^2$, therefore,

ABC : FGH :: ACD : FHI.

By the ſame manner of reaſoning,

ACD : FHI :: ADE : FIK,

and ſo on if there be more triangles; hence, from this ſeries of equal ratios, it follows (2. cor. 8. 3.) that ABC+ACD+ADE, or the polygon ABCDE, is to FGH+FHI+FIK, or the polygon FGHIK, as one of the antecedents ABC is to its conſequent FGH, or as AB^2 to FG^2; therefore, ſimilar polygons are to each other as the ſquares of their homologous ſides.

Proportions of Figures.

Cor. 1. If three ſimilar figures have their homologous ſides equal to the three ſides of a right-angled triangle, the figure having the greateſt ſide ſhall be equal to the two others; for theſe three figures are proportional to the ſquares of their homologous ſides, and the ſquare of the hypothenuſe is equal to the ſquares of the other two ſides.

Cor. 2. Similar polygons have to each other the duplicate ratio of their homologous ſides. For let L be a third proportional to the homologous ſides AB, FG, then (def. 11. 3.) AB has to L the duplicate ratio of AB to FG; but AB : L :: AB^2 : AB×L (3.), or, ſince AB×L=FG^2, (cor. to 8.) AB : L :: $AB^2 : FG^2$ :: ABCDE : FGHIK, therefore the figure ABCDE has to the figure FGHIK, the duplicate ratio of AB to FG.

Theorem XXVIII.

The ſegments of two chords AB, CD, which cut each other within a circle, are reciprocally proportional, that is AO : DO :: CO : OB. Fig. 88.

Join AC and BD; and becauſe the triangles AOC, BOD have the angles at O equal (4. 1.), and the angle A=D and the angle C=B (15. 2.) the triangles are ſimilar; therefore the homologous ſides are proportional, (20.) that is, AO : DO :: CO : BO.

Cor. Hence AO×BO=CO×DO, (8.) that is, the rectangle contained by the ſegments of the one chord is equal to the rectangle contained by the ſegments of the other.

Theorem XXIX.

If from a point O without a circle, two ſtraight lines be drawn, terminating in the concave arch BC; the whole lines ſhall be reciprocally proportional to the parts of them without the circle, that is OB : OC :: OD : OA. Fig. 90.

Join AC, BD; then the triangles OAC, OBD have the common angle O, alſo the angle B=C (15. 2.), therefore the triangles are ſimilar, and the homologous ſides are proportional, that is, OB : OC :: OD : OA.

Cor. Therefore (8.) OA×OB=OC×OD, that is, the rectangles contained by the whole lines, and the parts of them without the circle, are equal to one another.

Theorem XXX.

If from a point O without a circle a ſtraight line OA be drawn touching the circle, and alſo a ſtraight line OC cutting it, the tangent ſhall be a mean proportional between the whole line Fig. 91.

Problems.

which cuts the circle, and the part of it without the circle, that is, OC : OA :: OA : OD.

For if AC, AD be joined, the triangles OAD, OCA, have the angle at O common to both, alſo the angle ACD or ACO is equal to DAO (18. 2.), therefore the triangles are ſimilar (20.), and conſequently CO : OA :: OA : OD.

Cor. Therefore (cor. to 8.) $CO \times OD = OA^2$, that is, the ſquare of the tangent is equal to the rectangle contained by the whole line which cuts the circle, and the part of it without the circle.

Theorem XXXI.

Fig. 92. In the ſame circle, or in equal circles, any angles ACB, DEF are to each other as the arches AB, DF of the circles intercepted between the lines which contain the angles.

Suppose the arch AB to have to the arch DF the ratio of the number p to the number q; then the arch AB being ſuppoſed divided into equal parts A g, g h, h B, the number of which is p, the arch DF ſhall contain q equal parts D k, k l, l m, m n, n F, each of which is equal to any one of the equal parts into which AB is divided. Draw ſtraight lines from the centres of the circles to the points of diviſion, theſe lines will divide ACB into p angles and DEF into q angles, which are all equal (13. 2.) therefore, the angle ACB has to the angle DEF the ratio of the number p to the number q, which ratio is the ſame as that of the arch AB to the arch DF.

Problems.

Cor. Hence it appears that angles may be meaſured and compared with each other by means of arches of circles deſcribed on the vertices of the angles as centres, obſerving, however, that the radii of the circles muſt be equal.

SECT. V. PROBLEMS.

Problem I.

Plate CCXLIII. fig. 93. To biſect a given ſtraight line AB; that is, to divide it into two equal parts.

From the points A and B as centres, with any radius greater than the half of AB, deſcribe arches, cutting each other in D and D on each ſide of the line AB. Draw a ſtraight line through the points D, D, cutting AB in C; the line AB is biſected in C.

For the points D, D, being equally diſtant from the extremities of the line AB, are each in a ſtraight line perpendicular to the middle of AB, (16. 1.), therefore the line DCD is that perpendicular, and conſequently C is the middle of AB.

Problem II.

Fig. 94. To draw a perpendicular to a given ſtraight line BC, from a given point A in that line.

Take the points B and C at equal diſtances from A; and on B and C as centres, with any radius greater than BA, deſcribe arches, cutting each other in D; draw a ſtraight line from A through D, which will be the perpendicular required. For the point D, being at equal diſtances from the extremities of the line BC, muſt be in a perpendicular to the middle of BC (16. 1.), therefore AD is the perpendicular required.

Problem III.

Fig. 95. To draw a perpendicular to a given line, BD, from a given point A without that line.

On A as a centre, with a radius ſufficiently great, deſcribe an arch, cutting the given line in two points B, D; and on B and D as centres, with a radius greater than the half of BD, deſcribe two arches, cutting each other in E; draw a ſtraight line through the points A and E, meeting BD in C; the line AC is the perpendicular required.

For the two points A and E are each at equal diſtances from B and D; therefore, a line paſſing through A and E is perpendicular to the middle of BD, (16. 1.).

Problem IV.

At a given point A, in a given line AB, to make an angle equal to a given angle K. Fig. 96.

On K as a centre, with any radius, deſcribe an arch to meet the lines containing the angle K, in L and I; and on A as a centre, with the ſame radius, deſcribe an indefinite arch BO; on B as a centre, with a radius equal to the chord LI, deſcribe an arch, cutting the arch BO in D; draw AD, and the angle DAB ſhall be equal to K.

For the arches BD, LI having equal radii and equal chords, the arches themſelves are equal (4. 2.), therefor the angles A and K are alſo equal (13. 2.).

Problem V.

To biſect a given arch AB, or a given angle C. Fig. 97.

First. To biſect the arch AB, on A and B as centres, with one and the ſame radius, deſcribe arches to interſect in D; join CD, cutting the arch in E, and the arch AE ſhall be equal to EB.

For, ſince the points C and D are at equal diſtances from A, and alſo from B, the line which joins them is perpendicular to the middle of the chord AB (16. 1.), therefore, the arch AB is biſected at E, (6. 2.).

Secondly. To biſect the angle C; on C as a centre, with any diſtance, deſcribe an arch, meeting the lines containing the angle in A and B; then find the point D

Problems. D as before, and the line CD will manifeſtly biſect the angle C, as required.

SCHOLIUM.

By the ſame conſtruction we may biſect each of the arches AE, EB; and again we may biſect each of the halves of theſe arches, and ſo on; thus by ſucceſſive ſubdiviſions, an arch may be divided into four, eight, ſixteen parts, &c.

PROBLEM VI.

Fig. 98. Through a given point A, to draw a ſtraight line parallel to a given ſtraight line BC.

ON A as a centre, with a radius ſufficiently large, deſcribe the indefinite arch EO; on E for a centre, with the ſame radius, deſcribe the arch AF; in EO take ED equal to AF, draw a line from A through D, and AD will be parallel to BC.

For if AE be joined, the angle EAD is equal to AEB (13. 2.), and they are alternate angles, therefore AD is parallel to BC, (22. 1.).

PROBLEM VII.

Fig. 99. To conſtruct a triangle, the ſides of which may be equal to three given lines A, B, C.

TAKE a ſtraight line, DE, equal to one of the given lines A; on D as a centre, with a radius equal to another of the lines B, deſcribe an arch; on E as a centre, with a radius equal to the remaining line C, deſcribe another arch, cutting the former in F; join DF and EF, and DEF will be the triangle required, as is ſufficiently evident.

SCHOLIUM.

It is neceſſary that the ſum of any two of the lines be greater than the third line (7. 1.).

PROBLEM VIII.

Fig. 100. To conſtruct a parallelogram, the adjacent ſides of which may be equal to two given lines A, B, and the angle they contain equal to a given angle C.

DRAW the ſtraight line DE=A; make the angle GDE=C, and take DG=B; deſcribe two arches, one on G as a centre, with a radius GF=DE, and the other on E, with a radius EF=DG; then DEFG ſhall be the parallelogram required.

For by conſtruction the oppoſite ſides are equal, therefore, the figure is a parallelogram, (27. 1.) and it is ſo conſtructed, that the adjacent ſides and the angle they contain have the magnitudes given in the problem.

COR. If the given angle be a right angle, the figure will be a rectangle; and if the adjacent ſides be alſo equal, the figure will be a ſquare.

Problems.

PROBLEM IX.

To find the centre of a given circle, or of a circle of which an arch is given. Fig. 101.

TAKE any three points A, B, D, in the circumference of the circle, or in the given arch, and having drawn the ſtraight lines AB, BD, biſect them by the perpendiculars EG, FH; the point C where the perpendiculars interſect each other is the centre of the circle, as is evident from Theorem VI. ſect. 2.

SCHOLIUM.

By the very ſame conſtruction a circle may be found that ſhall paſs through three given points A, B, C; or that ſhall be deſcribed about a given triangle ABC.

PROBLEM X.

To draw a tangent to a given circle through a given point A. Fig. 102, 103.

IF the given point A be in the circumference (fig. 102.), draw the radius AC; and through A, draw AD perpendicular to AC, and AD will be a tangent to the circle, (9. 2.). But if the given point A be without the circle, (fig. 103.) draw AC to the centre, and biſect AC in O, and on O as a centre, with OA or OC as a radius, deſcribe a circle which will cut the given circle in two points D and D'; join AD and AD', and each of the lines AD, AD', will be a tangent to the circle.

For, draw the radii CD, CD', then each of the angles ADC, AD'C is a right angle, (17. 2.); therefore AD and AD' are both tangents to the circle, (9. 2.).

COR. The tangents AD, AD' are equal to one another, (17. 1.)

PROBLEM XI.

To inſcribe a circle in a given triangle ABC. Fig. 104.

BISECT A and B any two angles of the triangle by the ſtraight lines AO, BO, which meet each other in O; from O draw OD, OE, OF, perpendiculars to its ſides; theſe lines ſhall be equal to one another.

For in the triangles ODB, OEB, the angles ODB =OEB, and the angle OBD=OBE; therefore the remaining angles BOD, BOE, are equal; and as the ſide OB is common to both triangles, they are equal to one another, (6. 1.), therefore the ſide OD=OE; in the ſame manner it may be demonſtrated, that OD =OF; therefore the lines OD, OE, OF, are equal to one another, and conſequently a circle deſcribed on O as a centre, with OD as a radius, will paſs through E and F; and as the ſides of the triangle are tangents to the circle, (9. 2.) it will be inſcribed in the triangle.

PROBLEM XII.

Upon a given ſtraight line AB, to deſcribe a ſeg- Fig. 105.

Problems.

ment of a circle that may contain an angle equal to a given angle C.

PRODUCE AB towards D, and at the point B make the angle DBE equal to the given angle C; draw BO perpendicular to BE, and GO perpendicular to the middle of AB, meeting BO in O; on O as a centre, with OB as a radius, deſcribe a circle, which will paſs through A, and AMB ſhall be the ſegment required.

For ſince FE is perpendicular to BO, FE is a tangent to the circle, therefore the angle EBD (which is equal to C by conſtruction) is equal to any angle AMB in the alternate ſegment, (18. 2.).

PROBLEM XIII.

Fig 106 Fig. 107. To divide a ſtraight line, AB, into any propoſed number of equal parts; or into parts having to each other the ſame ratios that given lines have.

FIRST, Let it be propoſed to divide the line AB, (fig. 106.) into five equal parts. Through the extremity A draw an indefinite line AG, take AC of any magnitude, and take CD, DE, EF, and FG, each equal to AC, that is, take AG equal to five times AC; join GB, and draw CI parallel to GB, the line AI ſhall be one-fifth part of AB, and AI being taken five times in AB, the line AB ſhall be divided into five equal parts.

For ſince CI is parallel to GB, the ſides AG and AB are cut proportionally in C and I; but AC is the fifth part of AG; therefore AI is the fifth part of AB.

Next, let it be propoſed to divide AB (fig. 107.) into parts, having to each other the ratios that the lines P, Q, R, have. Through A draw AG, and in AG take AC=P, CD=Q, DE=R; join EB, and draw CI and DK parallel to EB; the line AB ſhall be divided as required.

For, becauſe of the parallels CI, DK, EB, the parts AI, IK, KB, have to each other the ſame ratios that the parts AC, CD, DE have, (17. 4.) which parts are by conſtruction equal to the given lines P, Q, R.

PROBLEM XIV.

Fig. 108. To find a fourth proportional to three given lines, A, B, C.

DRAW two ſtraight lines DE, DF, containing any angle; on DE take DA=A, and DB=B, and on DF take DC=C; join AC, and draw BX parallel to AC; then, BX ſhall be the fourth proportional required.

For, becauſe BX is parallel to AC, DA : DB :: DC : DX (17. 4.) that is, A : B :: C : DX, therefore DX is a fourth proportional to A, B, and C.

COR. The ſame conſtruction ſerves to find a third proportional to two lines A and B; for it is the ſame as a fourth proportional to the lines A, B, and B.

PROBLEM XV.

Fig. 109. To find a mean proportional between two ſtraight lines, A, B.

UPON any ſtraight line DF take DE=A, and EF =B; and on DF as a diameter deſcribe a ſemicircle DGF; draw EG perpendicular to DF, meeting the circle in G; the line EG ſhall be the mean proportional required. Problems.

For, if DG, FG, be joined, the angle DGF is a right angle, (17. 2.) therefore, in the right-angled triangle DGF, GE is a mean proportional between DE and EF, (23. 4.).

PROBLEM XVI.

To divide a given ſtraight line AB into two parts, ſo that the greater may be a mean proportional between the whole line and the other part. Fig. 110.

AT B, one of the extremities of the line, draw BC perpendicular to AB, and equal to the half of AB; on C as a centre, with CB as a radius, deſcribe a circle; join AC, meeting the circle in D; make AF= AD, and AB ſhall be divided at F in the manner required.

For ſince AB is perpendicular to the radius, it is a tangent to the circle (9. 2.), and if AC be produced to meet the circle in E, AB : AF :: AE : AB, (30. 4.) and by diviſion, AB—AF : AF :: AE—AB : AB; but AB—AF=BF, and ſince DE=2BC=AB, therefore AE—AB=AD=AF, therefore BF : AF :: AF : AB.

SCHOLIUM.

When a line is divided in this manner it is ſaid to be divided in *extreme and mean ratio.*

PROBLEM XVII.

To make a ſquare equivalent to a given parallelogram or to a given triangle. Fig. 112. Fig. 123.

FIRST, Let ABCD be a given parallelogram, (fig. 112.) the baſe of which is AB, and altitude DE; find XY a mean proportional between AB and DE, (by problem 15.) and XY ſhall be the ſide of the ſquare required.

For ſince by conſtruction AB : XY :: XY : DE, therefore, $XY^2=AB\times DE$ (8. 4.) = parallelogram ABCD (5. 4.).

Next, let ABC be a given triangle (fig. 113.) BC its baſe, and AD its altitude; find XY a mean proportional between half the baſe and the altitude, and XY ſhall be the ſide of the ſquare required.

For ſince $\frac{1}{2}BC : XY :: XY : AD$; therefore (8. 4.) $XY^2=\frac{1}{2}BC\times AD$=triangle ABC (6. 4.).

PROBLEM XVIII.

Upon a given line EF, to conſtruct a rectangle EFGX equivalent to a given rectangle ABCD. Fig. 114.

FIND a fourth proportional to the three lines EF, AB and AD; (by problem 14.) draw EX, perpendicular to EF, and equal to that fourth proportional, and complete the rectangle EFGX, which will have the magnitude required.

For ſince EF : AB :: AD : EX, therefore (8. 4.) $EF\times EX=AB\times AD$, that is, the rectangle EFGX is equal to the rectangle ABCD.

PROBLEM

Problem XIX.

Fig. 111. To make a triangle equivalent to a given polygon ABCDE.

First, draw the diagonal CE, ſo as to cut off the triangle CDE; draw DG parallel to CE, to meet AE produced in G; join CG, and the given polygon ABCDE ſhall be equivalent to another polygon ABCG which has one ſide fewer.

For ſince DG is parallel to CE, the triangle CGE is equivalent to the triangle CDE, (2. cor. 2. 4.) to each add the polygon ABCE, and the polygon ABCDE ſhall be equivalent to the polygon ABCG.

In like manner, if the diagonal CA be drawn, alſo BF parallel to CA, meeting EA produced, and CF be joined, the triangle CFA is equivalent to the triangle CBA, and thus the polygon ABCDE is transformed to the triangle CFG.

In this way a triangle may be found equivalent to any other polygon, for by transforming the figure into another equivalent figure that has one ſide fewer, and repeating the operation, a figure will at laſt be found which has only three ſides.

Scholium.

As a ſquare may be found equivalent to a triangle, by combining this problem with Prob. XVII. a ſquare may be found equivalent to any rectilineal figure whatever.

Problem XX.

Plate CCXLII. Fig. 89. Upon a given line FC to conſtruct a polygon ſimilar to a given polygon ABCDE.

Draw the diagonals AC, AD; at the point F, make the angle GFH=BAC, and at the point G, make the angle FGH=ABC; thus a triangle FGH will be conſtructed ſimilar to ABC. Again, on FH conſtruct in like manner a triangle FIH, ſimilar to ADC and ſimilarly ſituated; and on FI conſtruct a triangle FKI ſimilar to AED and ſimilarly ſituated; and theſe triangles FGH, FHI, FIK ſhall form a polygon FGHIK ſimilar to ABCDE (26. 4.).

Problem XXI.

Plate CCXLIII. Fig. 115. To inſcribe a ſquare in a given circle.

Draw two diameters AC, BD, ſo as to interſect each other at right angles; join the extremities of the diameters A, B, C, D, and the figure ABCD ſhall be a ſquare inſcribed in the circle.

For the angles AOB, BOC, &c. being all equal, the chords AB, BC, CD, DA are equal; and as each of the angles of the figure ABCD is in a ſemicircle, it is a right angle, (17. 2.) therefore the figure is a ſquare.

Problem XXII.

Fig. 116. To inſcribe a regular hexagon and alſo an equilalateral triangle in a given circle.

From any point A in the circumference, apply AB and BC each equal to AO the radius; draw the three diameters AD, BE, CF, and join their adjacent extremities by the lines AB, BC, &c. and the figure ABCDEF thus formed is the hexagon required.

For the triangles AOB, BOC being by conſtruction equilateral, each of the angles AOB, BOC is one-third of two right angles, (4. cor. 24. 1.) and ſince AOB+BOC+COD=two right angles, therefore COD=one-third of two right angles, therefore, the three angles AOB, BOC, COD, are equal, and as theſe are equal to the angles AOF, FOE, EOD; the ſix angles at the centre are all equal; therefore, the chords AB, BC, CD, DE, EF, FA are all equal; thus the figure is equilateral. It is alſo equiangular, for the angles FAB, ABC, &c. are in equal ſegments, each having for its baſe the chord of two-ſixths of the circumference, therefore, the angles A, B, &c. are equal (15. 2.).

If ſtraight lines be drawn joining A, C, E, the vertices of the alternate angles of the hexagon, there will be formed an equilateral triangle inſcribed in a circle; as is ſufficiently evident.

Scholium.

As the form of reaſoning by which it has been ſhewn that an equilateral hexagon inſcribed in a circle is alſo equiangular, will apply alike to any equilateral polygon; it may be inferred that every equilateral polygon inſcribed in a circle is alſo equiangular.

Problem XXIII.

To inſcribe a regular pentagon in a given circle. Fig. 117.

Draw any radius AO, and divide it into two parts AF, FO, ſuch, that AO : OF :: OF : AF; (16.) from A place AG in the circumference equal to OF; join OG, and draw the chord AHB perpendicular to OG, the chord AB ſhall be a ſide of the pentagon required.

Join GF, and becauſe AO : OF :: OF : AF, and that AG=OF, therefore, AO : AG :: AG : AF; now the angle A is common to the two triangles OAG, GAF, and it has been ſhewn that the ſides about that angle in the two triangles are proportionals; therefore (22. 4.) the triangles are ſimilar, and the triangle AOG being iſoſceles, the triangle AGF is alſo iſoſceles, ſo that AG=GF; but AG=FO, (by conſtruction) therefore, GF=FO, and the angle FOG=FGO, and FOG + FGO =2 FOG; but AFG = FOG + FGO, (23. 1.) and AFG=FAG, therefore FAG= 2 FOG; hence in the iſoſceles triangle AOG, each of the angles at the baſe is double the vertical angle AOG, therefore the ſum of all the angles is equal to five-times the vertical angle AOG; but the ſum of all the angles is equal to two right angles, (24. 1.) therefore the angle AOG is one-fifth of two right angles, and conſequently AOB=2AOG=two-fifths of two right angles equal one-fifth of four right angles, therefore the arch AB is one-fifth of the whole circumference. If we now ſuppoſe ſtraight lines BC, CD, DE, to be applied in the circle each equal to AB, the chord of one-fifth of the circumference, and AE to be joined, the figure thus formed will be an equilateral pentagon, and it is alſo equiangular (Schol. 22.).

Problem

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PROBLEM XXIV.

Having given ABCD, &c. a regular polygon inſcribed in a circle, to deſcribe a regular polygon of the ſame number of ſides about the circle.

DRAW GH a tangent to the circle at T the middle of the arch AB; do the ſame at the middle of each of the other arches BC, CD, &c. theſe tangents ſhall form a regular polygon GHIK, &c. deſcribed about the circle.

Join OG, OH, &c. alſo OT and ON. In the triangles OTH, ONH, the ſide OT=ON, and OH is common to both, and OTH, ONH, are right angles, therefore the triangles are equal (17. 1.) and the angles TOH=NOH; now B is the middle of the arch TN, therefore OH paſſes through B; and in the ſame manner it appears that I is in the line OC produced, &c. Now becauſe OT biſects the arch AB it is perpendicular to the chord AB (6. 2.), therefore GH is parallel to AB (9. 2. and 18. 1.), and HI to BC, therefore the angle GHO=ABO, and IHO=CBO, and hence GHI=ABC; and in like manner it appears, that HIK=BCD, &c. therefore the angles of the circumſcribed polygon are equal to thoſe of the inſcribed polygon. And becauſe of the parallels, GH : AB :: OH : OB, and HI : BC :: OH : OB, therefore, GH : AB :: HI : BC; but AB=BC; therefore GH=HI. For the ſame reaſon HI=IK, &c. therefore, the polygon is regular, and ſimilar to the inſcribed polygon.

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SECT. VI. OF THE QUADRATURE OF THE CIRCLE.

AXIOM.

Fig. 120. IF ABC be an arch of a circle, and AD, CD be two tangents at its extremities, interſecting each other in D; the ſum of the tangents AD, DC is greater than the arch ABC.

Fig. 118. COR. Hence the perimeter of any polygon deſcribed about a circle, is greater than the circumference of the circle.

PROPOSITION I. THEOREM.

Fig. 119. Equilateral polygons, ABCDEF, GHIKLM, of the ſame number of ſides inſcribed in circles are ſimilar, and are to one another as the ſquares of the radii of the circles.

As each of the polygons is by hypotheſis equilateral, it will alſo be equiangular (Schol. 22. 5.). Let us ſuppoſe, for example, that the polygons are hexagons; then, as the ſum of the angles is the ſame in both, viz. eight right angles (25. 1.), the angle A will be one-fixth part of eight right angles, and the angle G will be the ſame; therefore A=G; in like manner B=H, C=K, &c. and as the figures are equilateral, AB : GH :: BC : HI :: CD : IK, &c. therefore (2. def. 4.) the figures are ſimilar. Draw AO, BO, GP, HP to the centres of the circles; then, becauſe the angle AOB is the ſame part of four right angles that the arch AB is of the whole circumference; and the angle GPH the ſame part of four right angles that GH is of the whole circumference (13. 2.) the angles AOB, GPH are each the ſame part of four right angles; therefore they are equal; the iſoſceles triangles AOB, GPH are therefore ſimilar, (22. 4.) and conſequently AB : GH :: AO : GP, therefore (9. and 27. 4.) polygon ABCDEF : polygon GHIKLM :: AO^2 : GP^2.

PROP. II. THEOREM.

Fig. 121. A circle being given, two ſimilar polygons may be found, the one inſcribed in the circle, and the other deſcribed about it, which ſhall differ from each other by a ſpace leſs than any given ſpace.

LET AG be the ſide of a ſquare equal to the given ſpace; and let ABG be ſuch an arch of the given circle, that AG is its chord. Biſect the fourth part of the circumference, (5. 5.) then biſect one of its halves, and proceed in this manner, till, by repeated biſections, there will at length be found an arch AB leſs than AG. As the arch thus found will be contained in the circumference a certain number of times exactly, its chord AB is the ſide of a regular figure inſcribed in the circle; apply lines in the circle, each equal to AB, thus forming the regular figure ABC, &c. and deſcribe a regular figure DEF, &c. of the ſame number of ſides about the circle. Then, the exceſs of the circumſcribed figure above the inſcribed figure ſhall be leſs than the ſquare upon AG. For draw lines from D and E to O the centre; theſe lines will paſs through A and B (24. 5.); alſo, a line drawn from O, to H the point of contact of the line DE, will biſect AB, and be perpendicular to it; and AB will be parallel to DE. Draw the diameter AL, and join BL, which will be parallel to HO (18. 4.). Put P for the circumſcribed polygon, and p for the incribed polygon; then, becauſe the triangles ODH, OAK are evidently like parts of P and p, P : p :: ODH : OAK (1. 3.); but the triangles ODH, OAK being ſimilar, ODH : OAK :: OH^2 : OK^2 (25. 4.), and on account of the ſimilar triangles OAK, LAB, OA^2 or OH^2 : OK^2 :: LA^2 : LB^2 (20. and 9. 4.); therefore, P : p :: LA^2 : LB^2, and by diviſion and inverſion, P : P—p :: LA^2 : LA^2—LB^2, or AB^2; but LA^2, that is, the ſquare deſcribed about the circle, is greater than the equilateral polygon of eight ſides deſcribed about the circle, becauſe it contains that polygon, and for the ſame reaſon the polygon of eight ſides is greater than the polygon of ſixteen ſides, and ſo on; therefore $LA^2 > P$, and as it has been proved that P : P—p :: LA^2 : AB^2, of which proportion, the firſt term P is leſs than the third LA^2; therefore (2. 3.) the ſecond P—p is leſs than the fourth AB^2, but $AB^2 < AG^2$, therefore P—$p < AG^2$.

COR. 1. Becauſe the polygons P and p differ from one another more than either of them differs from the circle, the difference between each of them, and the circle, is leſs than the given ſpace, viz. the ſquare of AG. And therefore, however ſmall any ſpace, may be,

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be, a polygon may be inſcribed in the circle, and another deſcribed about it, each of which ſhall differ from the circle by leſs than the given ſpace.

Cor. 2. A ſpace which is greater than any polygon that can be inſcribed in a circle, but which is leſs than any polygon that can be deſcribed about it, is equal to the circle itſelf.

Prop. III. Theorem.

Fig. 121. The area of any circle is equal to a rectangle contained by the radius, and a ſtraight line equal to half the circumference.

Let ABC, &c. be any equilateral polygon inſcribed in the circle, and DEF, &c. a ſimilar polygon deſcribed about it; draw lines from the extremities of AB and DE a ſide of each polygon to O the centre; and let OKH be perpendicular to theſe ſides. Put P for the perimeter of the polygon DEF, &c. and p for the perimeter of the polygon ABC, &c. and n for the number of the ſides of each. Then, becauſe $n \times \frac{1}{2}DE = \frac{1}{2}P$, $n \times \frac{1}{2}DE \times OH = \frac{1}{2}P \times OH$, but $n \times \frac{1}{2}DE \times OH = n \times$ triangle DOE = polygon DEF, &c. therefore, $\frac{1}{2}P \times OH =$ polygon DEF, &c.; and in like manner it appears, that $\frac{1}{2}p \times OK =$ polygon ABC, &c. Now let Q denote the circumference of the circle, then, becauſe $\frac{1}{2}Q > \frac{1}{2}p$, and $OH > OK$, therefore $\frac{1}{2}Q \times OH > \frac{1}{2}p \times OK$, that is $\frac{1}{2}Q \times OH$ is greater than the inſcribed polygon. Again, becauſe $\frac{1}{2}Q < \frac{1}{2}P$ (axiom), therefore $\frac{1}{2}Q \times OH < \frac{1}{2}P \times OH$, that is, $\frac{1}{2}Q \times OH$ is leſs than the circumſcribed polygon: Thus it appears that $\frac{1}{2}Q \times OH$ is greater than any polygon inſcribed in the circle, but leſs than any polygon deſcribed about it; therefore, $\frac{1}{2}Q \times OH$ is equal to the circle. (2.).

Prop. IV. Theorem.

Fig. 119. The areas of circles are to one another as the ſquares of their radii.

Let ABCDEF and GHIKLM be equilateral polygons of the ſame number of ſides inſcribed in the circles, and OA, PG their radii; and let Q be ſuch a ſpace, that $AO^2 : GP^2 ::$ circle ABD : Q; then, becauſe $AO^2 : GP^2 ::$ polygon ABCDEF : polygon GHIKLM, and $AO^2 : GP^2 ::$ circle ABE : Q, therefore polygon ABCDEF : polygon GHIKLM :: circle ABE : Q; but circle ABE > polygon ABCDEF, therefore Q > polygon GHIKLM; that is, Q is greater than any polygon inſcribed in the circle GHL. In the ſame manner it is demonſtrated that Q is leſs than any polygon deſcribed about the circle GHL; therefore Q is equal to the circle GHL (2.). And becauſe $AO^2 : GP^2 ::$ circle ABD : Q, therefore $AO^2 : GP^2 ::$ circle ABE : circle GHL.

Cor. 1. The circumferences of circles are to one another as their radii. Put M for half the circumference of the circle ABE, and N for half the circumference of GKL; then, circle ABE : circle GHL :: $AO^2 : GP^2$; but $\frac{1}{2}M \times AO =$ circle ABE, alſo $\frac{1}{2}N \times GP =$ circle GHL, (3.) therefore $\frac{1}{2}M \times AO : \frac{1}{2}N \times GP :: AO^2 : GP^2$, and by alternation $\frac{1}{2}M \times AO : AO^2 :: \frac{1}{2}N \times GP : GP^2$, therefore (3. 4.) $\frac{1}{2}M : AO :: \frac{1}{2}N : GP$, and again by alternation $\frac{1}{2}M : \frac{1}{2}N :: AO : GP$, therefore M : N :: AO : GP.

Cor. 2. A circle deſcribed with the hypothenuſe of a right-angled triangle as a radius, is equal to two circles deſcribed with the other two ſides as radii. Let the ſides of the triangle be a, b and the hypothenuſe h, and let the circles deſcribed with theſe lines as radii be A, B and H. Of the Quadrature of the Circle.

becauſe $A : H :: a^2 : h^2$
and $B : H :: b^2 : h^2$,
therefore $A+B : H :: a^2+b^2 : h^2$ (8. 3.)
but $a^2+b^2=h^2$ (13. 4.), therefore A+B=H.

Prop. V. Problem.

Having given the area of a regular polygon inſcribed in a circle, and alſo the area of a ſimilar polygon deſcribed about it; to find the areas of regular inſcribed and circumſcribed polygons, each of double the number of ſides. Fig. 122.

Let AB be the ſide of the given inſcribed polygon, and EF parallel to AB that of the ſimilar circumſcribed polygon, and C the centre of the circle; if the chord AM, and the tangents AP, BQ be drawn, the chord AM ſhall be the ſide of the inſcribed polygon of double the number of ſides; and PQ or 2PM that of the ſimilar circumſcribed polygon. Put A for the area of the polygon, of which AB is a ſide, and B for the area of the circumſcribed polygon; alſo a for the area of the polygon of which AM is a ſide, and b for the area of the ſimilar circumſcribed polygon; then A and B are by hypotheſis known, and it is required to find a and b.

I. The triangles ACD, ACM, which have a common vertex A, are to one another as their baſes CD, CM; beſides, theſe triangles are to one another as the polygons, of which they form like parts, therefore $A : a ::$ CD : CM. The triangles, CAM, CME, which have a common vertex M, are to each other as their baſes CA, CE; they are alſo to one another as the polygons a and B, of which they are like parts; therefore, $a : B ::$ CA : CE; but becauſe of the parallels DA, ME, CD : CM :: CA : CE; therefore, $A : a :: a : B$; therefore, the polygon a, which is one of the two required, is a mean proportional between the two known polygons A and B, ſo that $a = \sqrt{A \times B}$.

II. The triangles CPM, CPE, having the ſame altitude CM, are to one another as PM to PE. But as CP biſects the angle MCE, PM : PE :: CM : CE (19. 4.) :: CD : CA :: A : a; therefore, CPM : CPE :: A : a; and conſequently CPM+CPE, or CME : CPM :: $A+a$: A, and CME : 2 CPM :: $A+a$: 2 A; but CME and 2 CPM, or CMPA, are to one another as the polygons B and b, of which they are like parts; therefore, $A+a : 2A :: B : b$. Now the polygon a has been already found, therefore by this laſt proportion the polygon b is determined; that is, $b = \frac{2A \times B}{A+a}$.

Prop VI. Problem.

To find nearly the ratio of the circumference of a circle to its diameter.

Let the radius of the circle =1, then, the ſides of the inſcribed ſquare being the hypothenuſe of a right-angled triangle of which the radii are the ſides, (ſee fig.

fig. 115.) the area of the inſcribed ſquare will be 2; (13. 4.) and the circumſcribed ſquare, being the ſquare of the diameter, will be 4. Now, retaining the notation of laſt problem, if we make A=2 and B=4, the formulæ $a=\sqrt{A\times B}$, $b=\frac{2A\times B}{A+a}$ gives us $a=2.8284271$, &c. the area of the inſcribed octagon, and $b=3.3137085$, &c. the area of the circumſcribed octagon. By ſubſtituting theſe numbers in the formulæ, inſtead of A and B, we ſhall obtain the areas of the inſcribed and circumſcribing polygons of 16 ſides; and thence we may find thoſe of 32 ſides, and ſo on as in the following table:

N° *of ſides.*	*Ins. Polygons.*	*Circ. Polygons.*
4	2.0000000	4.0000000
8	2.8284271	3.3137085
16	3.0614674	3.1825979
32	3.1214451	3.1517249
64	3.1365485	3.1441184
128	3.1403311	3.1432236
256	3.1412772	3.1417504
512	3.1415138	3.1416321
1024	3.1415729	3.1416025
2048	3.1415877	3.1415951
4096	3.1415914	3.1415933
8192	3.1415923	3.1415928
16384	3.1415925	3.1415927
32768	3.1415926	3.1415926

Hence it appears that the areas of a regular polygon of 32768 ſides inſcribed in the circle, and of a ſimilar polygon deſcribed about it, differ ſo little from each other, that the numbers which expreſs them are the ſame as far as the eighth decimal place. And as the circle is greater than the one polygon, and leſs than the other, its area will be nearly 3.1415926. But the area is the product of the radius and the half of the circumference; therefore, the radius being unity, half the circumference is 3.1415926 nearly; and the radius is to half the circumference, or the diameter is to the circumference, nearly as 1 to 3.1415926.

Scholium.

In this way the ratio of the diameter to the circumference may be found to any degree of accuracy; but neither by this, nor any other method yet known, can the ratio be exactly determined.

Archimedes, by means of inſcribed and circumſcribed polygons of 96 ſides, found that the diameter is to the circumference as 7 to 22, nearly, which ratio is nearer to the truth than can be expreſſed by any ſmaller numbers; and Metius found it to be more nearly as 113 to 355. Both of theſe expreſſions are convenient on account of the ſmallneſs of the numbers, but later mathematicians have carried the approximation to a much greater degree of accuracy. Thus, it has been found that the diameter being 1, the circumference is greater than 3.14159265358979 32, but leſs than the ſame number having its laſt figure increaſed by unity; and ſome have even had the patience to carry the approximation as far as the 150th place of decimals.

SECT. VII.

Definitions.

I. A ſtraight line is *perpendicular*, or at right angles, to a plane, when it is perpendicular to every ſtraight line meeting it in that plane. The plane is alſo perpendicular to the line.

II. A line is *parallel* to a plane, when they cannot meet each other, although both be produced. The plane is alſo parallel to the line.

III. Parallel planes are ſuch as cannot meet each other, though produced.

IV. It will be demonſtrated (Theor. 3.) that the common ſection of two planes is a ſtraight line; this being premiſed, the *inclination* of two planes is the angle contained by two ſtraight lines drawn perpendicular to the line, which is their common ſection, from any point in it, the one perpendicular being drawn in the one plane, and the other in the other plane.

This angle may be either acute or obtuſe.

V. If it be a right angle the two planes are perpendicular to each other.

VI. A *ſolid angle* is that which is made by the meeting of more than two plane angles, which are not in the ſame plane, in one point. Thus the ſolid angle S is formed by the plane angles ASB, BSC, CSD, DSA.

Theorem I.

One part of a ſtraight line cannot be in a plane and another part above it.

For from the definition of a plane (7. def. 1.) it is manifeſt that if a ſtraight line coincide with a plane in two points it muſt be wholly in the plane.

Theorem II.

Two ſtraight lines which cut each other in a plane determine its poſition; that is, the plane can coincide with theſe lines only in one poſition. Plate CCXLIV. Fig. 123.

Let the ſtraight lines AB, AC cut each other in A; conceive a plane to paſs through AB, and to be turned about that line, till it paſs through the point C; and this it can manifeſtly do only in one poſition; then, as the points A and C are in the plane, the whole line AC muſt be in the plane; therefore there is only one poſition in which the plane can coincide with the ſame two lines AB, AC.

Cor. Therefore a triangle ABC, or three points A, B, C not in a ſtraight line, determine the poſition of a plane.

Theorem III.

If two planes AB, CD interſect each other, their interſection is a ſtraight line. Fig. 123.

Let E and F be two points in the line of common ſection, and let a ſtraight line EF be drawn between them; then the line EF muſt be in the plane AB,

(7. def. 1.) and the ſame line muſt alſo be in the ſame plane CD, therefore it muſt be the common ſection of them both.

Theorem IV.

Fig. 125. If a ſtraight line AP is perpendicular to two ſtraight lines PB, PC at P the point of their interſection; it will alſo be perpendicular to the plane MN, in which theſe lines are.

Draw any other line PQ in the plane MN, and from Q any point in that line draw QD parallel to PB; make DC=DP; join CQ, meeting PB in B; and join AB, AQ, AC. Becauſe DQ is parallel to PB, and PD=DC; therefore BQ=QC, and BC is biſected in Q: Hence in the triangle BAC,

$$AB^2+AC^2=2\,AQ^2+2\,BQ^2, \text{ (16. 4.)}$$

and in the like manner, in the triangle PBC,

$$PB^2+PC^2=2\,PQ^2+2\,CQ^2;$$

therefore, taking equal quantities from equal quantities, that is, ſubtracting the two laſt quantities, which are put equal to each other, from the two firſt, and obſerving that as APB, APC are by hypotheſis right-angled triangles, $AB^2-BP^2=AP^2$, and $AC^2-CP^2=AP^2$, we have

$$AP^2+AP^2=2\,AQ^2-2\,PQ^2,$$

and therefore $AP^2=AQ^2-PQ^2$, or $AP^2+PQ^2=AQ^2$; therefore the triangle APQ is right-angled at P, (ſchol. 15. 4.) and conſequently AP is perpendicular to the plane MN (Def. 1.).

Cor. 1. The perpendicular AP is ſhorter than any oblique line AQ, therefore it meaſures the diſtance of the point A from the plane.

Cor. 2. From the ſame point P in a plane no more than one perpendicular can be drawn. For if it be poſſible that there can be two perpendiculars, conceive a plane to paſs through them, and to interſect the plane MN in the ſtraight line PQ; then theſe perpendiculars will be in the ſame plane, and both perpendicular to the ſame line PQ, at the ſame point P in that line, which is impoſſible.

It is alſo impoſſible that from a point without a plane two perpendiculars can be drawn to the plane; for if the ſtraight lines AP, AQ could be two ſuch perpendiculars, then the triangle APQ would have two right angles, which is impoſſible.

Theorem V.

Fig. 126. If a ſtraight line AP be perpendicular to a plane MN, every ſtraight line DE parallel to AP is perpendicular to the ſame plane.

Let a plane paſs through the parallel lines AP, DE, and interſect the plane MN in the line PD; through D draw BC at right angles to PD; take DC=DB, and join PB, PC, AB, AC, AD. Becauſe DB=DC, therefore PB=PC; (cor. 5. 1.) and becauſe AP is perpendicular to the plane MN, ſo that APB, APC are right angles, AB=AC, (cor. 5. 1.) therefore ABC is an iſoſceles triangle; and ſince its baſe BC is biſected at D, BC is perpendicular to AD; (ſchol. 11. 1.) but by conſtruction BC is perpendicular to PD; therefore (4.) BC or BD is perpendicular to the plane paſſing through the lines AD and PD, or AP and DE; hence BD is perpendicular to DE, but PD is alſo perpendicular to DE, (19. 1.) therefore DE is perpendicular to the two lines DP, DB; and therefore it is perpendicular to the plane MN paſſing through them.

Cor. 1. Converſely, if the ſtraight lines AP, DE are perpendicular to the ſame plane MN, they are parallel; for if not, through D draw a parallel to AP; this parallel will be perpendicular to the plane MN, (by the theorem) therefore, from the ſame point D two perpendiculars may be drawn to a plane, which is impoſſible (4.).

Cor. 2. Two ſtraight lines A and B which are parallel to a third line C, though not in the ſame plane, are parallel to each other. For ſuppoſe a plane to be perpendicular to the line C, the lines A and B parallel to this perpendicular are perpendicular to the ſame plane; therefore, by the preceding corollary they are parallel between themſelves.

Theorem VI.

Two planes MN, PQ, perpendicular to the ſame ſtraight line AB, are parallel to each other. Fig. 127.

For, if they can meet each other, let O be a point common to both, and join OA, OB; then the line AB, which is perpendicular to the plane MN, muſt be perpendicular to AO, a line drawn in the plane MN from the point in which AB meets that plane. For the ſame reaſon AB is perpendicular to BO; therefore OA, OB are two perpendiculars drawn from the ſame point O, to the ſame ſtraight line AB, which is impoſſible.

Theorem VII.

The interſections EF, GH of two parallel planes MN, PQ with a third plane FG, are parallel. Fig. 128.

For if the lines EF, GH, ſituated in the ſame plane, are not parallel, they muſt meet if produced; therefore, the planes MN, PQ, in which they are, muſt alſo meet, which is contrary to the hypotheſis of their being parallel.

Theorem VIII.

Any ſtraight line AB, perpendicular to MN, one of two parallel planes MN, PQ, is alſo perpendicular to PQ the other plane. Fig. 127.

From B draw any ſtraight line BC in the plane PQ, and let a plane paſs through the lines AB, BC, and meet the plane MN in the line AD, then AD will be parallel to BC, (7.), and ſince AB is perpendicular to the plane MN, it muſt be perpendicular to the line AD, therefore it is alſo perpendicular to BC; (19. 1.) hence (Def. 1.) the line AB is perpendicular to the plane PQ.

Theorem IX.

Parallel ſtraight lines EG, FH, comprehended between two parallel planes MN, PQ, are equal. Fig. 128.

Let a plane paſs through the lines EG, FH, and meet

meet the parallel planes in EF and GH; then EF and GH are parallel (7.) as well as EG and FH; therefore, EGHF is a parallelogram, and EF=GH.

Cor. Hence two parallel planes are everywhere at the same distance from each other. For, if EF and GH are perpendicular to the two planes, they are parallel, (1. cor. 5.) therefore they are equal.

Theorem X.

Fig. 129. If two straight lines CA, EA, meeting one another, be parallel to two other lines DB, FB, that meet one another, though not in the same plane with the first two; the first two and the other two shall contain equal angles, and the plane passing through the first two shall be parallel to the plane passing through the other two.

Take AC=BD, AE=BF, and join CE, DF, AB, CD, EF. Because AC is equal and parallel to BD, the figure ABDC is a parallelogram; therefore, CD is equal and parallel to AB. For a similar reason EF is equal and parallel to AB; therefore also CE is equal and parallel to DF (2 cor. 5. and 28. 1.); therefore the triangles CAE, DBF are equal, (10. 1.) hence the angle CAE=DBF.

In the second place, the plane ACE is parallel to the plane BDF: For suppose that the plane parallel to BDF, passing through the point A, meets the lines CD, EF in any other points than C and E, (for example in G and H), then (9.) the three lines AB, GD, FH are equal; but the three lines AB, CD, EF have been shewn to be equal; therefore, CD=GD, and FH=EF, which is absurd, therefore the plane ACE is parallel to BDF.

Theorem XI.

Fig. 130. If a straight line AP be perpendicular to a plane MN, any plane APB, passing through AP, shall be perpendicular to the plane MN.

Let BC be the intersection of the planes AB, MN; if in the plane MN the line DE be drawn perpendicular to BP, the line AP, being perpendicular to the plane MN, shall be perpendicular to each of the straight lines BC, DE; therefore the angle APD is a right angle; now PA and PD are drawn in the planes AB, MN perpendicular to their common section, therefore (5. Def.) the planes AB, MN are perpendicular to each other.

Scholium.

When three straight lines, such as AP, BP, DP, are perpendicular to each other, each is perpendicular to the plane of the two other lines.

Theorem XII.

Fig. 130. If the plane AB is perpendicular to the plane MN; and in the plane AB a straight line PA be drawn perpendicular to BP, the common intersection of the planes, then shall PA be perpendicular to the plane MN.

For, if in the plane MN, a line PD be drawn perpendicular to PB, the angle APD shall be a right angle, because the planes are perpendicular to each other, therefore, the line AP is perpendicular to the two lines PB, PD, therefore it is perpendicular to their plane MN.

Cor. If the plane AB be perpendicular to the plane MN, and from any point P, in their common intersection, a perpendicular be drawn to the plane MN; this perpendicular shall be in the plane AB; for if it is not, a perpendicular AP may be drawn in the plane AB to the common intersection BP, which will be at the same time perpendicular to the plane MN; therefore, at the same point P, there may be two perpendiculars to a plane NM, which is impossible (4.).

Theorem XIII.

If two planes AB, AD are perpendicular to a third, their common intersection AP is perpendicular to the third plane. Fig. 130.

For, if through the point P, a perpendicular be drawn to the plane MN, this perpendicular shall be in the plane AB, and also in the plane AD, (cor. 12.) therefore it is at their common intersection AP.

Theorem XIV.

If two straight lines be cut by parallel planes, they shall be cut in the same ratio. Fig. 131.

Let the line AB meet the planes MN, PQ, RS in A, E, B; and let CD meet them in C, F, D, then shall AE : EB :: CF : FD. For draw AD meeting the plane PQ in G, and join AC, EG, GF, BD; the lines EG, BD, being the common sections of the plane of the triangle ABD and the parallel planes PQ, RS, are parallel (7.), and in like manner it appears, that AC, GF are parallel; therefore AE : EB (:: AG : GD) :: CF : FD.

Theorem XV.

If a solid angle be contained by three plane angles, the sum of any two of these is greater than the third. Fig. 132.

It is evidently only necessary to demonstrate the theorem, when the plane angle which is compared with the sum of the other two is greater than either of them; for, if it were equal to or less than one of them, the theorem would be manifest: therefore let S be a solid angle formed by three plane angles ASB, ASC, BSC, of which ASB is the greatest. In the plane ASB make the angle BSD=BSC; draw any straight line ADB, and having taken SC=SD, join AC, BC; the triangles BSC, BSD having two sides, and the included angle of the one equal to two sides, and the included angle of the other, each to each, are equal (5. 1.), therefore BD=BC; now AB$\angle$AC+BC, therefore, taking BD from the first of these unequal quantities, and BC from the second, we get AD$\angle$AC; and as the triangles ASD, ASC have SD=SC, and SA common to both, and AD$\angle$AC, therefore (9. 1.) the angle ASD$\angle$ASC; and, adding DSB to the one, and CSB to the other, ASB$\angle$ASC+BSC.

Theorem XVI.

If each of two solid angles be contained by three plane Fig. 133.

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plane angles equal to one another, each to each, the planes in which the equal angles are, have the same inclination to one another.

Let the angle ASB=DTE, the angle ASC =DTF, and the angle BSC=ETF; the two planes ASB, ASC, shall have to each other the same inclination as the two planes DTE, DTF.

Take A any point in SA, and in the two planes ASB, ASC, draw AB and AC perpendiculars to AS, then (def. 4.) the angle BAC is the inclination of these planes; again, take TD=SA, and in the planes TDE, TDF draw DE and DF perpendiculars to TD, and the angle EDF shall be the inclination of these other planes; join BC, EF. The triangles ASB, DTE have the side AS=DT, the angle SAB=TDE and ASB=DTE, therefore the triangles are equal, and thus AB=DE, and SB=TE: In like manner it appears that the triangles ASC, DTF are equal, and therefore, that AC=DF, and SC=TF. Now the triangles BSC, ETF, having BS=TE, SC=TF, and the angle BSC=ETF, are also equal, and therefore BC=EF; but it has been shewn that AB=DE, and that AC=DF; therefore the triangles BAC, EDF are equal, and consequently the angle BAC=EDF; that is, the inclination of the planes ASB and ASC is equal to the inclination of the planes DTE and DTF. In the same manner it may be proved that the other planes have the same inclination to one another.

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Scholium.

If the three plane angles which contain the solid angles, are equal each to each, and if besides the angles are also *disposed in the same order* in the two solid angles, then these angles when applied to one another will coincide, and be equal. But if the plane angles be *disposed in a contrary order*, the solid angles will not coincide, although the theorem is equally true in both cases. In this last case the solid angles are called *Symmetrical angles*.

SECT. VIII. OF SOLIDS BOUNDED BY PLANES.

Definitions.

I. A *SOLID* is that which has length, breadth, and thickness.

II. A *Prism* is a solid contained by plane figures, of which two that are opposite are equal, similar, and parallel; and the others are parallelograms.

Fig. 134. To construct this solid, let ABCDE be any polygon; if in a plane parallel to ABC there be drawn straight lines FG, GH, HI, &c. equal and parallel to the sides AB, BC, CD, &c. so as to form a polygon FGHIK equal to ABCDE, and straight lines AF, BG, CH, &c. be drawn, joining the vertices of the homologous angles in the two planes; the planes or faces ABGF, BCHG, &c. thus formed will be parallelograms; and the solid ABCDEFGHIK contained by these parallelograms and the two polygons, is the prism itself.

III. The equal and parallel polygons ABCDE, FGHIK are called the *Bases* of the prism, and the distance between the bases is its *Altitude*.

Fig. 135. IV. When the base of a prism is a parallelogram, and consequently the figure has all its faces parallelograms, it is called a *parallelopiped*. A parallelopiped is *rectangular* when all its faces are rectangles.

Plate CCXLV. Fig. 144. V. A *Cube* is a rectangular parallelopiped contained by six equal squares.

VI. A *Pyramid* is a solid contained by several planes, which meet in the same point A, and terminate in a polygonal plane BCD.

VII. The polygon ABCDE is called the *Base* of the pyramid; the point S is its *Vertex*; and a perpendicular let fall from the vertex upon the base is called its *Altitude*.

VIII. Two solids are *similar*, when they are contained by the same number of similar planes, similarly situated, and having like inclinations to one another.

Theorem I.

Two prisms are equal when the three planes which contain a solid angle of the one are equal to the three planes which contain a solid angle of the other, each to each, and are similarly situated. Plate CCXLIV. fig. 134.

Let the base ABCDE be equal to the base *abcde*, the parallelogram ABGF equal to the parallelogram *abgf*, and the parallelogram BCHG equal to the parallelogram *bchg*; the prism ABCI shall be equal to the prism *abci*.

For let the base ABCDE be applied to its equal the base *abcde*, so that they may coincide with each other; then, as the three plane angles which form the solid angle B are equal to the three plane angles which form the angle *b*, each to each, viz. ABC=*abc* ABG=*abg*, and GBC=*gbc*, and as these angles are similarly situated, the solid angles B and *b* are equal (15. 7.) therefore the side BG shall fall upon the side *bg*; and because the parallelograms ABGF, *abgf* are equal, the side FG shall fall upon its equal *fg*; in like manner it may be shewn, that GH falls upon *gh*, therefore the upper base FGHIK coincides entirely with its equal *fghik*, and the two solids coincide with each other, or occupy the same space, therefore the prisms are equal.

Scholium.

A prism is entirely determined, when its base ABCDE is known, and its edge BG is given in magnitude and position; for if through the point G, GF be drawn equal and parallel to AB, and GH equal and parallel to BC, and the polygon FGHIK be described equal to ABCDE (20. 5.), it is evident that the

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points FKI will have determinate positions; therefore any two prisms constructed with the same *data* cannot be unequal.

Theorem II.

Fig. 135. In any parallelopiped the opposite planes are equal and parallel.

From the nature of the solid (4. def.) the bases ABCD, EFGH are equal parallelograms, and their sides are parallel, therefore the planes AC, EG are parallel; and because AD is equal and parallel to BC, and AE is equal and parallel to BF, the angle DAE =CBF, and the plane DAE is parallel to the plane CBF, (10. 7.) therefore also the parallelogram DAEH is equal to the parallelogram CBFG. It may in like manner be demonstrated, that the opposite parallelograms ABFE, DCGH are equal and parallel.

Cor. Hence, in a parallelopiped, any one of the six planes which contain it may be taken for its base.

Theorem III.

Fig. 136. The plane BDHF, which passes through two parallel opposite edges BF, DH, of a parallelopiped AG, divides it into two triangular prisms ABDHEF, GHFBCD, equal to one another.

For the triangles ABD, EFH, having their sides equal and parallel, are equal, and the lateral faces ABFE, ADHE, BDHF are parallelograms; therefore the solid ABDHEF is a prism; for like reasons the solid GHFBCD is a prism. Again, because the plane angles which contain the solid angle at G are equal to those which contain the solid angle at A, viz. the angle FGH=DAB, FGC=DAE, and HGC =BAE, the planes in which these angles are have the same inclination to one another, (16. 7.); as, however, these angles are not disposed in the same order, but in a contrary order, the solid angles cannot be made to coincide with one another, and consequently the prisms cannot be proved equal by superposition, as in Theorem I. Their equality may however be established by reasoning thus:

The inclination of each of any two adjacent faces of a prism to the base, and the length of an edge being given, the prism is evidently restricted to one determinate magnitude; and it will evidently have the same magnitude whichsoever of the two sides of the base it may stand upon; that is, whether it be constructed above or below the base. Now if the upper base FGH of the one prism be applied to the lower base DAB of the other, so that the sides FG, GH, FH may be upon the sides DA, AB, DB equal to them, then the prism GHFBCD will have the position ABDHEF′; and the two faces ABF′E′, ADH′E′ of the prism below the base will have each the same inclination to it, as the equivalent faces ABFE, ADHE of the prism above the base; and the edge AE′ is equal to the edge AE; therefore the conditions which determine the magnitude of both prisms are identical, and consequently the prisms are equal.

Theorem IV.

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Fig. 137. Fig. 138. If two parallelopipeds AG, AL have a common base ABCD, and have their upper bases in the same plane, and between the same parallel straight lines EK, HL, the two parallelopipeds are equivalent to each other.

Because AE is parallel to BF, and HE to GF, the angle AEI=BFK, HEI=GFK, and HEA =GFB; of these six angles the three first form the solid angle E, and the three others form the solid angle F; therefore since the plane angles are equal each to each, and similarly situated, the solid angles E and F are equal. Now if the prism AEIDHM be applied to the prism BFKCGL, so that their bases AEI, BFK, which are equal, may coincide with each other, then, because the solid angle E is equal to the solid angle F, the side EH shall fall upon FG, and this is all that is necessary to prove that the two prisms coincide entirely, for the base AEI and the edge EH determine the prism AEM, and the base BFK and the edge FG determine the prism BFL; therefore the prisms are equal. But if from the solid AEL, the prism AEM be taken away, there will remain the parallelopiped AIL; and if from the same solid AEL, the prism BFL be taken away, there will remain the parallelopiped AEG; therefore the parallelopipeds AIL, AEG are equivalent to each other.

Theorem V.

Parallelopipeds upon the same base, and having the same altitude, are equivalent to one another. Fig. 139.

Let ABCD be the common base of the two parallelopipeds AG, AL, which, because they have the same altitude, will have their upper bases in the same plane; then, because EF and AB are equal and parallel, as also IK and AB; EF is parallel to IK, (cor. 2. 5. 7.) for a similar reason GF is parallel to LK. Let the sides EF, HG, as also the sides LK, IM, be produced, so as to form by their intersections the parallelogram NOPQ; it is manifest that this parallelogram is equal to each of the bases EFGH, IKLM. Now, if we suppose a third parallelopiped, which, with the same lower base ABCD, has for its upper base NOPQ, this third parallelopiped will be equivalent to the parallelopiped AG, (4.) for the same reason the third parallelopiped will be equivalent to the parallelopiped AL; therefore the two parallelopipeds AG, AL, which have the same base and the same altitude, are equivalent to one another.

Theorem VI.

Any parallelopiped AG is equivalent to a rectangular parallelopiped, having the same altitude, and an equivalent base. Fig. 139. 140.

At the points A, B, C, D, let AI, BK, CL, DM, be drawn perpendicular to the plane ABCD, and terminating in the plane of the upper base; then, IK, KL,

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KL, LM, MI, being joined, a parallelopiped AL will thus be formed, which will manifeſtly have its lateral faces AK, BL, CM, DI rectangles; and if the baſe AC is alſo a rectangle, the ſolid AL will be a rectangular parallelopiped equivalent to the parallelopiped AG. But if ABCD is not a rectangle, (fig. 140.) draw AO and BN perpendicular to CD, and OQ and NP perpendicular to DC, meeting ML in Q and P; the ſolid ABNOIKPQ will manifeſtly be a rectangular paralellopiped, which will be equal to the parallelopiped AL, for they have the ſame baſe ABKI, and the ſame altitude, viz. AO; therefore the rectangular parallelopiped AP is equivalent to the parallelopiped AG, (fig. 139.) and they have the ſame altitude, and the baſe ABNO of the former is equivalent to the baſe ABCD of the latter.

Theorem VII.

Fig. 134. Any ſection NOPQR of a priſm, made by a plane parallel to its baſe ABCDE, is equal to the baſe.

For the parallels AN, BO, CP contained between the parallel planes ABC, NOP are equal (9. 7.); and thus all the figures ABON, BCPO, &c. are parallelograms; hence the ſide ON=AB, OP=BC, PQ=CD, &c. alſo, the equal ſides are parallel, therefore, the angle ABC=NOP, the angle BCD=OPQ, &c. therefore the two polygons ABCDE, NOPQR, have their ſides and angles equal, each to each; therefore, they are equal.

Theorem VIII.

Plate CCXLV. Fig. 141. Two rectangular parallelopipeds AG, AL, which have the ſame baſe ABCD, are to each other as their altitudes AE, AI.

Suppose that the altitudes AE, AI are to each other as the numbers p and q, ſo that AE will contain p ſuch equal parts as AI contains q. Let AE and AI be divided into p and q equal parts reſpectively, and let planes paſs through the points of diviſion parallel to the baſe ABCD; thus the parallelopiped AG will be divided into p ſolids, which will alſo be parallelopipeds having equal baſes (7.) and equal altitudes, therefore they will be equal among themſelves; and in like manner the parallelopiped AL will be divided into q equal ſolids; and as each of the ſolids in AG is equal to each of the ſolids in AL, the parallelopiped AG will contain p ſuch equal parts as the parallelopiped AL contains q; therefore the parallelopiped AG will be to the parallelopiped AL as the number p to the number q, that is, as AE the altitude of the former to AI the altitude of the latter.

Theorem IX.

Fig. 142. Two rectangular parallelopipeds AG, AK, which have the ſame altitude AE, are to each other as their baſes ABCD, AMNO.

Let the two ſolids be placed, the one by the ſide of the other, as repreſented in the figure, and let the plane ONKL be produced, ſo as to meet the plane DCGH in PQ, thus forming a third parallelopiped AQ, which may be compared with each of the parallelopipeds AG, AK. The two ſolids AG, AQ, having the ſame baſe ADHE, are to each other as their altitudes AB, AO, (8) and, in like manner, the two ſolids AQ, AK, having the ſame baſe AOLE, are to each other as their altitudes AD, AM; that is,

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$$\textit{ſolid}\ \mathrm{AG} : \textit{ſol.}\ \mathrm{AQ} :: \mathrm{AB} : \mathrm{AO}$$
$$\textit{ſol.}\ \mathrm{AQ} : \textit{ſol.}\ \mathrm{AK} :: \mathrm{AD} : \mathrm{AM};$$

but $\mathrm{AB} : \mathrm{AO} :: \textit{baſe}\ \mathrm{AC} : \textit{baſe}\ \mathrm{AP}$ (3. 4.)
and $\mathrm{AD} : \mathrm{AM} :: \textit{baſe}\ \mathrm{AP} : \textit{baſe}\ \mathrm{AN}$,

therefore,

$$\textit{ſol.}\ \mathrm{AG} : \textit{ſol.}\ \mathrm{AQ} :: \textit{baſe}\ \mathrm{AC} : \textit{baſe}\ \mathrm{AP},$$
$$\textit{ſol.}\ \mathrm{AQ} : \textit{ſol.}\ \mathrm{AK} :: \textit{baſe}\ \mathrm{AP} : \textit{baſe}\ \mathrm{AN},$$

therefore (7. 3.)

$$\textit{ſol.}\ \mathrm{AG}. \textit{ſol.}\ \mathrm{AK} :: \textit{baſe}\ \mathrm{AC} : \textit{baſe}\ \mathrm{AN}.$$

Theorem X.

Rectangular parallelopipeds are to each other as the products of the numbers proportional to their baſes and altitudes, or as the products of the numbers proportional to their three dimenſions. Fig 142.

Let AG be a parallelopiped, the three dimenſions of which are expreſſed by the lines AB, AD, AE, and AZ another parallelopiped the dimenſions of which are expreſſed by the lines AO, AM, AX. Let the two ſolids AG, AZ be ſo placed that their ſurfaces may have a common angle BAE; produce ſuch of the planes as are neceſſary ſo as to form a third parallelopiped AK, having the ſame altitude as the parallelopiped AG. By the laſt propoſition

$$\textit{ſol.}\ \mathrm{AG} : \textit{ſol.}\ \mathrm{AK} :: \textit{baſe}\ \mathrm{AC} : \textit{baſe}\ \mathrm{AN},$$

and by the laſt theorem but one,

$$\textit{ſol.}\ \mathrm{AK} : \textit{ſol.}\ \mathrm{AZ} :: \mathrm{AE} : \mathrm{AX},$$

but, conſidering the baſes AC, AN as meaſured by numbers, as alſo the altitudes AE, AX,

$$\textit{baſe}\ \mathrm{AC} : \textit{baſe}\ \mathrm{AN} :: \mathrm{AE} \times \textit{baſe}\ \mathrm{AC} : \mathrm{AE} \times \textit{baſe}\ \mathrm{AN}$$
and $\mathrm{AE} : \mathrm{AX} :: \mathrm{AE} \times \textit{baſe}\ \mathrm{AN} : \mathrm{AX} \times \textit{baſe}\ \mathrm{AN}$

therefore,

$$\textit{ſol.}\ \mathrm{AG} : \textit{ſol.}\ \mathrm{AK} :: \mathrm{AE} \times \textit{baſe}\ \mathrm{AC} : \mathrm{AE} \times \textit{baſe}\ \mathrm{AN},$$
$$\textit{ſol.}\ \mathrm{AK} : \textit{ſol.}\ \mathrm{AZ} :: \mathrm{AE} \times \textit{baſe}\ \mathrm{AN} : \mathrm{AX} \times \textit{baſe}\ \mathrm{AN},$$

therefore, (7. 3.)

$$\textit{ſol.}\ \mathrm{AG} : \textit{ſol.}\ \mathrm{AZ} :: \mathrm{AE} \times \textit{baſe}\ \mathrm{AC} : \mathrm{AX} \times \textit{baſe}\ \mathrm{AN};$$

which proportion, by ſubſtituting for the baſes AC, AN their numerical values AB×AD and AO×AM becomes

$$\textit{ſol.}\mathrm{AG} : \textit{ſol.}\mathrm{AZ} :: \mathrm{AB} \times \mathrm{AD} \times \mathrm{AE} : \mathrm{AO} \times \mathrm{AM} \times \mathrm{AX}.$$

Scholium.

Hence it appears that the product of the baſe of a rectangular parallelopiped by its altitude or the product of its three dimenſions, may be taken for its numerical meaſure

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measure; and it is upon this principle that all other solids are estimated. When two parallelopipeds are compared together by means of their bases and altitudes, their bases must be considered as measured by the same superficial unit, and their altitudes by the same linear unit; thus if P and Q denote two parallelopipeds, and the base of P contains three such equal spaces as that of Q contains four; and the altitude of P contains two such equal lines, as that of Q contains five, then, $P : Q :: 3\times2 : 4\times5 :: 6 : 20$.

If all the dimensions of each solid are used in comparing them together, then the same linear unit must be employed in estimating all the dimensions of both solids; thus, if the length, breadth, and height of the solid P be four, three, and six linear units, respectively; and those of Q, seven, two, and five of the same unit; then $P : Q :: 4\times3\times6 : 7\times2\times5 :: 72 : 70$.

As lines are compared together by considering how often each contains some other line taken as a measuring unit, and surfaces by considering how often each contains a square whose side is that unit; so solids may be compared, by considering how often each contains a cube, the side or edge of which is the same linear unit. Accordingly, the dimensions of the parallelopipeds P and Q being as we have just now supposed, the proportion $P : Q :: 72 : 70$ may be considered as indicating that P contains 72 such equal cubes as Q contains 70.

The magnitude of a solid, its bulk, or its extension, constitutes its *solidity*, or its *content*; thus we say, that the solidity or the content of a rectangular parallelopiped is equal to the product of its base by its altitude; or to the product of its three dimensions.

Theorem XI.

The solidity of any parallelopiped, or in general of any prism, is equal to the product of its base by its altitude.

1. Any parallelopiped is equivalent to a rectangular parallelopiped of the same altitude, and an equivalent base (6.); and it has been shewn, that the solidity of such a parallelopiped is equal to the product of its base and altitude.

2. Every triangular prism is the half of a parallelopiped of the same altitude, but having its base double that of the prism (3.); therefore, the solidity of the prism is half that of the parallelopiped, or it is half the product of the base of the parallelopiped by its altitude, that is, it is equal to the product of the base of the prism by its altitude.

3. Any other prism may be divided into as many triangular prisms as the polygon which forms its base can be divided into triangles, but the solidity of each of these is equal to the product of its base by their common altitude; therefore, the solidity of the whole prism is equal to the product of the sum of all their bases by the common altitude, or it is equal to the product of the base of the prism, which is the sum of them all, by its altitude.

Cor. Two prisms having the same altitude are to each other as their bases; and two prisms having the same base are to each other as their altitudes.

Theorem XII.

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Similar prisms are to one another as the cubes of their homologous sides. Fig. 143.

Let AG, IP be two similar prisms, of which AB, IK are two homologous sides, the prism AG is to the prism IP as the cube of AB to the cube of IK. Let E and N be two homologous angles of the prisms, and ES, NV perpendiculars to the planes of their bases; join IV; take IR=AE, and in the plane INV draw RT perpendicular to IV; then RT shall be perpendicular to the plane IL (11. and 12. of 7.), also RT shall be equal to ES; for if the solid angles A and I were applied the one to the other, the planes which contain them would coincide (schol. 16. 7.), and the point E would fall upon the point R, and therefore the perpendicular ES would coincide with the perpendicular RT (2. cor. 4. 7.). Now the content of a prism being the product of its base by its altitude (11.), it follows that *prism* AG : *prism* IP :: ES × *base* AC :: NV × *base* IL; but *base* AC : *base* IL :: $AB^2 : IK^2$ (27. 4.) and therefore considering the lines expressed by numbers, ES × *base* AC or RT × *base* AC : NV × *base* IL :: RT × AB^2 : NV × IK^2 (5. 3.) therefore *prism* AG : *prism* IP :: RT × AB^2 : NV × IK^2; but RT : NV :: RI or AE : NI (20. 4.) :: AB : IK (def. of sim. figs.), and consequently RT × AB^2 : NV × IK^2 :: $AB^3 : IK^3$ (5. 3.); therefore *prism* AG : *prism* IP :: $AB^3 : IK^3$.

Cor. Similar prisms are to one another in the triplicate ratio of the homologous sides. For let Y and Z be two such lines that AB : IK :: IK : Y :: Y : Z, then the ratio of AB to Z is triplicate the ratio of AB to IK (12. def. 3.). Now, since AB : IK :: IK : Y, therefore $AB^2 : IK^2 :: IK^2 : Y^2$, (9. 4.) and, multiplying the antecedents by AB, and consequents by IK, $AB^3 : IK^3 :: AB \times IK^2 : IK \times Y^2 :: AB \times IK : Y^2$, but $Y^2 = IK \times Z$ (8. 4.); therefore $AB^3 : IK^3 :: AB \times IK : IK \times Z :: AB : Z$, but *prism* AG : *prism* IP :: $AB^3 : IK^3$, therefore *prism* AG : *prism* IP :: AB : Z, which last ratio is triplicate the ratio of AB to IK.

Theorem XIII.

If a triangular pyramid ABCD be cut by a plane *b c d* parallel to its base, the section *b c d* is similar to the base BCD. Fig. 144.

For because the planes *b c d*, BCD are parallel, their intersections *b c*, BC with a third plane BAC are parallel (7. 7.); and, for a like reason, *c d* is parallel to CD, and *d b* to DB; therefore the angle *b c d* = BCD, *c d b* = CDB, and *d b c* = DBC (10. 7.); hence the triangles *b c d*, BCD are equiangular, and consequently similar.

Cor. 1. If two triangular pyramids ABCD, EFGH, which have equal bases, and equal altitudes, be cut by planes *b c d*, *f g h* that are parallel to the bases, and at equal distances from them, the sections are equal. For conceive the bases of the pyramids to be in the same plane, then their vertices will be in a plane parallel to their bases, and the sections *b c d*, *f g h* will also be in a plane parallel to their bases, therefore, AB : A*b* :: EF :

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EF : E f (14. 7.), but becauſe the triangles ABC, A bc are ſimilar, AB : A b :: BC : bc, and, in like manner EF : Ef :: FG : fg, therefore, BC : bc :: FG : fg, and BC^2 : bc^2 :: FG^2 : fg^2 (9. 4.) ; but BC^2 : bc^2 :: *triangle* BCD : *trian.* bcd, and FG^2 : fg^2 :: *trian.* FGH : *trian.* fgh (25. 4.) ; therefore, *trian.* BCD : *trian.* bcd :: *trian.* FGH : *trian.* fgh, but *trian.* BCD = *trian.* FGH (by hyp.) therefore *trian.* bcd = *trian.* fgh.

Scholium.

It is eaſy to ſee that what is here demonſtrated of triangular pyramids, is equally true of polygonal pyramids having equal baſes and altitudes.

Theorem XIV.

Fig. 145. A ſeries of priſms of the ſame altitude may be circumſcribed about any pyramid ABCD, ſuch that the ſum of the priſms ſhall exceed the pyramid by a ſolid leſs than any given ſolid Z.

Let Z be equal to a priſm ſtanding on the ſame baſe with the pyramid, viz. the triangle BCD, and having for its altitude the perpendicular drawn from a certain point E in the line AC upon the place BCD. It is evident that CE multiplied by a certain number m will be greater than AC ; divide CA into as many equal parts as there are units in m, and let theſe be CF, FG, GH, HA, each of which will be leſs than CE. Through each of the points F, G, H, let planes be made to paſs parallel to the plane BCD, making with the ſides of the pyramid the ſections FPQ, GRS, HTU, which will be all ſimilar to one another, and to the baſe BCD (13.). From the point B draw in the plane of the triangle ABC the ſtraight line BK parallel to CF, meeting FP produced in K. In like manner, from D draw DL parallel to CF, meeting FQ in L ; join KL, and it is plain that the ſolid KBCDLF is a priſm. By the ſame conſtruction let the priſms PM, RO, TV be deſcribed. Alſo let the ſtraight line IP, which is in the plane of the triangle ABC be produced till it meet BC in h; and let the line MQ be produced till it meet DC in g. Join hg, then hCg QFP is a priſm ; and is equal to the priſm PM (cor 11). In the ſame manner is deſcribed the priſm m S equal to the priſm RO, and the priſm q U equal to the priſm TV. The ſum, therefore, of all the inſcribed priſms h Q, m S and q U is equal to the ſum of the priſms PM, RO and TV, that is, to the ſum of all the circumſcribed priſms except the priſm BL ; wherefore, BL is the exceſs of the priſms circumſcribed about the pyramid above the priſms inſcribed within it. But the priſm BL is leſs than the priſm which has the triangle BCD for its baſe, and for its altitude the perpendicular from E upon the plane BCD, which priſm is, by hypotheſis, equal to the given ſolid Z ; therefore the exceſs of the circumſcribed above the inſcribed priſms is leſs than the ſolid Z. But the exceſs of the circumſcribed priſms above the inſcribed is greater than their exceſs above the pyramid ABCD, becauſe ABCD is greater than the ſum of the inſcribed priſms; much more therefore is the exceſs of the circumſcribed priſms above the pyramid leſs than the ſolid Z. A ſeries of priſms of the ſame altitude has therefore been circumſcribed about the pyramid ABCD exceeding it by a ſolid leſs than the given ſolid Z.

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Theorem XV.

Pyramids that have equal baſes and altitudes are equal to one another. Fig. 146.

Let ABCD, EFGH be two pyramids that have equal baſes BCD, FGH, and alſo equal altitudes ; the pyramid ABCD is equal to the pyramid EFGH.

If they are unequal, let the pyramid EFGH exceed the pyramid ABCD by the ſolid Z. Let a ſeries of priſms of the ſame altitude be circumſcribed about the pyramid ABCD that ſhall exceed it by a ſolid leſs than Z, (14.) and let another ſeries equal in number to the former, and having all the ſame altitude, be deſcribed about the pyramid EFGH ; then, becauſe the pyramids have equal altitudes, the altitude of each of the priſms deſcribed about the one pyramid is equal to the altitude of each of the priſms deſcribed about the other pyramid ; therefore the ſections of the pyramids which are the baſes of the correſponding priſms will be at equal diſtances from the baſes of the pyramids, and hence theſe ſections will be equal ; (1. cor. 13.) and becauſe the priſms have all the ſame altitude, the correſponding priſms will be equal, and the ſum of the priſms deſcribed about the pyramid ABCD will be equal to the ſum of the priſms deſcribed about the pyramid EFGH. Let the pyramid EFGH be denoted by P, and the pyramid ABCD by p, and put Q for the ſum of the priſms deſcribed about P, and q for the priſms deſcribed about p : Then by hypotheſis $Z = P - p$, and by conſtruction $Z > q - p$, therefore $P - p > q - p$, and conſequently $P > q$; but it has been ſhewn that $q = Q$, therefore $P > Q$, that is, the pyramid EFGH is greater than the ſum of the priſm deſcribed about it, which is impoſſible, therefore the pyramids ABCD, EFGH are not unequal, that is, they are equal.

Theorem XVI.

Every priſm having a triangular baſe may be divided into three pyramids that have triangular baſes, and that are equal to one another. Fig. 147.

Let ABC, DEF be the oppoſite baſes of a triangular priſm. Join AE, EC, CD ; and becauſe ABED is a parallelogram, of which AE is the diameter, the triangle ADE is equal to the triangle ABE ; therefore the pyramid of which the baſe is the triangle ADE and vertex the point C, is equal to the pyramid of which the baſe is the triangle ABE, and vertex the point C. But the pyramid of which the baſe is the triangle ABE and vertex the point C, that is the pyramid ABCE, is equal to the pyramid DEFC, (15.) for they have equal baſes, viz. the triangles ABC, DFE, and the ſame altitude, viz. the altitude of the priſm ABCDEF. Therefore, the three pyramids ADEC, ABEC, DFEC are equal to one another ; but theſe pyramids make up the whole priſm ABCDEF ; therefore, the priſm ABCDEF is divided into three equal pyramids.

Cor. 1. From this it is manifeſt that every pyramid

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mid is the third part of a prism which has the same base and the same altitude with it; for if the base of the prism be any other figure than a triangle, it may be divided into prisms having triangular bases.

Cor. 2. Pyramids having equal altitudes are to one another as their bases; because the prisms upon the same bases, and of the same altitude, are to one another as their bases.

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SECT. IX. OF CYLINDERS, CONES, AND THE SPHERE.

Definitions.

I. A *Cylinder* is a solid figure described by the revolution of a right-angled parallelogram about one of its sides, which remains fixed

The *Axis* of the cylinder is the fixed straight line about which the parallelogram revolves

The *Bases* of the cylinder are the circles described by the two revolving opposite sides of the parallelogram.

II. A *Cone* is a solid figure described by the revolution of a right-angled triangle about one of the sides containing the right angle, which side remains fixed.

The *Axis* of the cone is the fixed line about which the triangle revolves.

The *Base* of the cone is the circle described by that side containing the right angle which revolves.

III. A *Sphere* is a solid figure described by the revolution of a semicircle about a diameter.

The *Axis* of a sphere is the fixed line about which the semicircle revolves.

The *Centre* of a sphere is the same with that of the semicircle.

The *Diameter* of a sphere is any straight line which passes through the centre, and is terminated both ways by the superficies of the sphere.

IV. *Similar* cones and cylinders are those which have their axes and diameters of their bases proportional.

Theorem I.

Fig. 148. If from any point E in the circumference of the base of a cylinder ABCD, a perpendicular EF be drawn to the plane of the base AEB, the straight line EF is wholly in the cylindric superficies.

Let HG be the axis, and AGHD the rectangle, which by its revolution describes the cylinder. Because HG is perpendicular to AG in every position of the revolving rectangle, it is perpendicular to the plane of the circle described by AG; and because AD, the line which describes the cylindric superficies, is parallel to GH, it is also perpendicular to the plane of that circle. (5. 7.). Now when by the revolution of the rectangle AGHD the point A coincides with the point E, the line EF will coincide with AD, and thus will be wholly in the cylindric superficies; for otherwise two perpendiculars might be drawn to the same plane, from the same point, which is impossible (2 cor. 4. 7.).

Theorem II.

Fig. 149. A cylinder and a parallelopiped having equivalent bases and the same altitude are equal to one another.

Let ABCD be a cylinder, and EF a parallelopiped having equivalent bases, viz. the circle AGB and the parallelogram EH, and having also equal altitudes; the cylinder ABCD is equal to the parallelopiped EF If not, let them be unequal; and first let the cylinder be less than the parallelopiped EF; and from the parallelopiped EF let there be cut off a part EQ by a plane PQ parallel to NF, equal to the cylinder ABCD. In the circle AGB inscribe the polygon AGKBLM that shall differ from the circle by a space less than the parallelogram PH, (1 cor. 2 6.) and cut off from the parallelogram EH a part OR equal to the polygon AGKBLM, then it is manifest that the parallelogram OR is greater than the parallelogram OP, therefore the point R will fall between P and N. On the polygon AGKBLM let an upright prism be constituted of the same altitude with the cylinder, which will therefore be less than the cylinder, because it is within it; (1.) and if through the point R a plane RS parallel to NF be made to pass, it will cut off the parallelopiped ES equal to the prism AGBC, because its base is equal to that of the prism, and its altitude is the same. But the prism AGBC is less than the cylinder ABCD, and the cylinder ABCD is equal to the parallelopiped EQ, by hypothesis; therefore, ES is less than EQ, and it is also greater, which is impossible. The cylinder ABCD therefore is not less than the parallelopiped EF; and in the same manner it may be shewn not to be greater than EF, therefore they are equal.

Theorem III.

If a cone and cylinder have the same base and the same altitude, the cone is the third part of the cylinder. Fig. 150.

Let the cone ABCD, and the cylinder BFKG have the same base, viz. the circle BCD, and the same altitude, viz. the perpendicular from the point A upon the plane BCD; the cone ABCD is the third part of the cylinder BFKG. If not, let the cone ABCD be the third part of another cylinder LMNO having the same altitude with the cylinder BFKG; but let the bases BCD, LIM be unequal, and first let BCD be greater than LIM. Then, because the circle BCD is greater than the circle LIM, a polygon may be inscribed in BCD that shall differ from it less than LIM does, (1. cor. 2. 6.) and which therefore will be greater than LIM. Let this be the polygon BECFD; and upon BECFD let there be constituted the pyramid ABECFD, and the prism BCFKHG. Because the polygon BECFD is greater than the circle LIM, the prism BCFKHG is greater than the cylinder LMNO, for they have the same altitude, but the prism has the greater base. But the pyramid ABECFD is the third part of the prism BCFHG (16. 8.); therefore it is greater

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greater than the third part of the cylinder LMNO. Now the cone ABECFD is by hypotheſis the third part of the cylinder LMNO, therefore, the pyramid ABECFD is greater than the cone ABCD, and it is alſo leſs, becauſe it is inſcribed in the cone, which is impoſſible. Therefore the cone ABCD is not leſs than the third part of the cylinder BFKG. And in the ſame manner, by circumſcribing a polygon about the circle BCD, it may be ſhewn, that the cone ABCD is not greater than the third part of the cylinder BFKG; therefore, it is equal to the third part of the cylinder.

Theorem IV.

Fig. 151. If a hemiſphere and cone have equal baſes and altitudes, a ſeries of cylinders may be inſcribed in the hemiſphere, and another ſeries may be circumſcribed about the cone, having all the ſame altitudes with one another, and ſuch that their ſum ſhall differ from the ſum of the hemiſphere and the cone by a ſolid, leſs than any given ſolid.

Let ADB be a ſemicircle, of which the centre is C, and let CD be at right angles to AB; let DB and DA be ſquares deſcribed on DC, draw CE, and let the figure thus conſtructed revolve about DC: then the quadrant BCD will deſcribe a hemiſphere having C for its centre, and the triangle CDE will deſcribe a cone having its vertex at C, and having for its baſe the circle deſcribed by DE, equal to that deſcribed by BC, which is the baſe of the hemiſphere. Let W be a given ſolid, a ſeries of cylinders may be deſcribed in the hemiſpere ADB, and another deſcribed about the cone ECI, ſo that their ſum ſhall differ from the ſum of the hemiſphere and cone, by a ſolid leſs than the ſolid W.

Upon the baſe of the hemiſphere let a cylinder be conſtituted equal to W, and let its altitude be CX. Divide CD into ſuch a number of equal parts, that each of them ſhall be leſs than CX; let theſe be CH, HG, GF and FD. Draw FN, GO, HP parallel to CB, meeting the circle in K, L, and M, and the ſtraight line CE in Q, R, and S. Draw K*f*, L*g*, M*h*, perpendicular to GO, HP, and CB; and draw Q*q*, R*r*, S*s*, perpendicular to the ſame lines. It is evident that the figure being thus conſtructed, if the whole revolve about CD, the rectangles F*f*, G*g*, H*h* will deſcribe cylinders that will be circumſcribed by the hemiſphere BDA; and that the rectangles DN, F*q*, G*r*, H*s* will alſo deſcribe cylinders that will circumſcribe the cone ICE. Now it may be demonſtrated, as was done of the priſms inſcribed in a pyramid (14. 8.), that the hemiſphere exceeds the ſum of all the cylinders deſcribed within it, by a ſolid leſs than the cylinder generated by the rectangle HB, that is, by a ſolid leſs than W. In the ſame manner it may be demonſtrated, that the ſum of the cylinders circumſcribing the cone ICE is greater than the cone by a ſolid leſs than the cylinder generated by the rectangle DN, that is, by a ſolid leſs than W. Therefore, ſince the ſum of the cylinders inſcribed in the hemiſphere together with a ſolid leſs than W, is equal to the hemiſphere; and ſince the ſum of the cylinders deſcribed about the cone is equal to the cone together with a ſolid leſs than W; adding equals to equals, the ſum of all the cylinders together with a ſolid leſs than W is equal to the hemiſphere and cone together with a ſolid leſs than W; therefore, the difference between the whole of the cylinders, and the ſum of the hemiſphere and the cone, is equal to the difference of two ſolids, each of which is leſs than W; but this difference muſt alſo be leſs than W; therefore the difference between the two ſeries of cylinders, and the ſum of the hemiſphere and cone is leſs than the given ſolid W.

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Theorem V.

The ſame things being ſuppoſed as in laſt theorem, the ſum of all the cylinders inſcribed in the hemiſphere, and deſcribed about the cone, is equal to a cylinder having the ſame baſe and altitude with the hemiſphere. Fig. 151.

For, the ſame conſtruction being ſuppoſed as in laſt theorem, let L be the point in which GO meets the circle ADB, then becauſe CGL is a right angle, if CL be joined, the circles deſcribed with the radii CG and GL are equal to the circle deſcribed with the radius CL or GO (2. cor. 4. 6.). Now CG=GR, becauſe CD=DE, therefore, the circles deſcribed by the revolution of the radii GR and GL about the point G are together equal to the circle deſcribed by the revolution of the radius GO about the ſame point G; therefore alſo the cylinders that ſtand upon the two firſt of theſe circles having the common altitude GH are equal to the cylinder which ſtands upon the remaining circle, and which has the ſame altitude GH. The cylinders deſcribed by the revolution of the rectangles G*g* and G*r* are therefore equal to the cylinder deſcribed by the rectangle GP. And as the ſame may be ſhewn of all the reſt, the cylinders deſcribed by the rectangles H*h*, G*g*, F*f*, and by the rectangles H*s*, G*r*, F*q*, DN, are together equal to the cylinder deſcribed by DB, that is, to the cylinder having the ſame baſe and altitude with the hemiſphere.

Theorem VI.

Every ſphere is two-thirds of the circumſcribing cylinder. Fig. 151.

Let the figure be conſtructed as in the two laſt theorems, and if the hemiſphere deſcribed by the quadrant BDC be not equal to two-thirds of the cylinder deſcribed by the rectangle BD, let it be greater by the ſolid W. Then as the cone deſcribed by CDE is one-third of the cylinder deſcribed by BD, the cone and the hemiſphere together will exceed the cylinder by W. But that cylinder is equal to the ſum of all the cylinders deſcribed by the rectangle H*h*, G*g*, F*f*, H*s*, G*r*, F*q*, DN; therefore, the hemiſphere and the cone added together exceed the ſum of all theſe cylinders by the ſolid W, which is abſurd; for it has been ſhewn (4.) that the hemiſphere and the cone together differ from the ſum of theſe cylinders by a ſolid leſs than W. The hemiſphere is therefore equal to two-thirds of the cylinder deſcribed

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ſcribed by the rectangle BD; and therefore the whole ſphere is two-thirds of the cylinder deſcribed by twice the rectangle BD, that is, to two-thirds of the circumſcribing cylinder.

WE here conclude the *Elements of Geometry*. Their application, conſtituting what is ſometimes called *Practical Geometry*, will be given under the article MENSURATION.

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A TABLE ſhewing the Theorem of the foregoing Treatiſe, that correſponds to each of the moſt material Propoſitions in the firſt ſix, and in the eleventh and twelfth, books of *Euclid's Elements*.

Euclid.	Geometry	Euclid.	Geometry	Euclid.	Geometry.	Euclid.	Geometry.	Euclid.	Geometry.
Book I	Theor. Sect.	Book I	Theor. Sect.	Book III.	Theor. Sect.	Book VI	Theor. Sect.	Book XI.	Theor Sect.
Prop. 4.	5. 1.	Pr. 41.	2. 4.	Pr. 28. 29.	4. 2.	Pr. 2.	17. 4. 18. 4.	9.	2 cor. 5. 7.
5.	11. 1.	47.	13. 4.	31.	17. 2.	3.	19. 4.	10.	10. 7.
6.	12. 1.	48.	ſcholium 15. 4.	32.	18. 2.	4.	20. 4.	13.	2 cor. 4. 7.
8.	10. 1.	Book II.	Theor. Sect.	35.	28. 4.	5.	21. 4.	14.	6. 7.
13.	1. 1.	Pr. 4.	10. 4.	36.	29. 4. 30. 4.	6.	22. 4.	15.	10. 7.
14.	3. 1.	5.	12. 4.	Book V.	Theor. Sect.	8.	23. 4.	16.	7. 7.
15.	4. 1.	7.	11. 4.	Pr. 4.	5. 3.	14. 15.	cor. 24. 4.	17.	14. 7.
16.	23. 1.	12.	15. 4.	12.	8. 3.	16. 17.	8. 4.	18.	11. 7.
17.	24. 1.	13.	14. 4.	15.	1. 3.	19.	25. 4.	19.	13. 7.
18. 19.	13. 1.	Book III	Theor. Sect.	16.	2. 3.	20.	26. 4. 27. 4.	20.	20. 7.
20.	7. 1.	Pr. 3.	6. 2.	17. 18. 19.	4. 3.	31.	1 cor. 27. 4.	24.	2. 8.
21.	8. 1.	10.	cor. 7. 2.	22.	6. 3.	33.	31. 4.	25.	8. 8.
24. 25.	9. 1.	11.	12. 2.	23.	7. 3.	Book XI.	Theor. Sect.	28.	3. 8.
26.	6. 1.	12.	11. 2.	24.	8. 3.	Pr. 1.	1. 7.	29.	4. 8.
27. 28.	22. 1.	14.	8. 2.	Book VI.	Theor. Sect.	3.	3. 7.	30. 31.	5. 8.
29.	21. 1.	15.	2. 2.	Pr. 1.	cor. 5. 4. cor. 6. 4.	4.	4. 7.	32.	9. 8.
30.	20. 1.	16.	8. 2.			6.	1 cor. 5. 7.	33.	12. 8.
32.	23. 24. 25. 1.	20.	9. 2.			8.	5. 7.	Book XII.	Theor Sect.
33.	28. 1.	21.	14. 2.					Pr. 1.	1. 6.
34.	26. 1.	22.	15. 2.					2.	4. 6.
35. 36.	1. 4.	26. 27.	16. 2. 13. 2.					7.	16. 8.
37. 38.	2 cor. to 2. 4.							10.	3. 9.

GEO

George.

GEORGE I. II. and III. kings of Great Britain.—George I. the ſon of Erneſt Auguſtus, duke of Brunſwick Lunenburgh, and elector of Hanover, ſucceeded to the throne of Great Britain in 1714, in virtue of an act of parliament, paſſed in the latter part of the reign of King William III. limiting the ſucceſſion of the crown, after the demiſe of that monarch, and Queen Anne (without iſſue), to the princeſs Sophia of Hanover, and the heirs of her body, being Proteſtants.—George II. the only ſon of the former, ſucceeded him in 1727, and enjoyed a long reign of glory; dying amidſt the moſt rapid and extenſive conqueſts in the 77th year of his age. He was ſucceeded by his grandſon George III. our preſent ſovereign. For particulars, ſee BRITAIN, N° 374—701.

GEO

George.

GEORGE, or *Knights of St GEORGE*, has been the denomination of ſeveral military orders, whereof that of the Garter is one of the moſt illuſtrious. See GARTER, and *St GEORGE*, below.

King GEORGE's Iſlands, are two iſlands in the South ſea, lying in W. Long. 144. 56. S. Lat. 14. 28. They were firſt diſcovered by Commodore Byron in 1765, and were ſince viſited by Captain Cook in 1774. Commodore Byron's people had an encounter with the inhabitants, which proved fatal to ſome of the natives; but Captain Cook was more fortunate. A lieutenant and two boats well-armed were ſent on ſhore by Captain Cook; and landed without oppoſition. As ſoon as the gentlemen landed, the iſlanders embraced them by touching noſes, a mode of civility uſed in New Zealand,

Fig. 1.

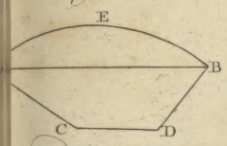
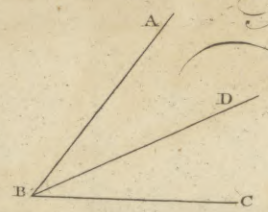


Fig. 2.



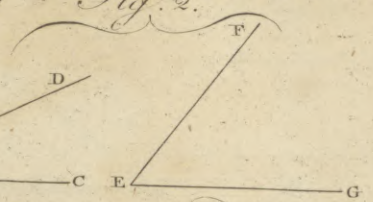


Fig. 3.

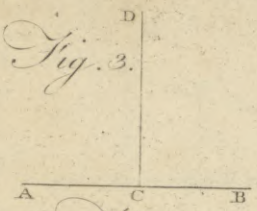


Fig. 4.

Fig. 5.

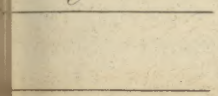


Fig. 6.

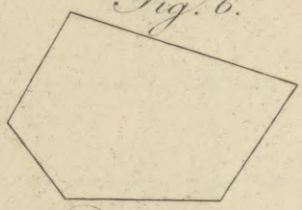


Fig. 7.

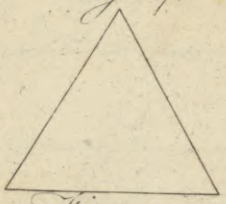


Fig. 8.

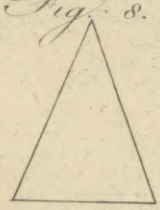


Fig. 9.

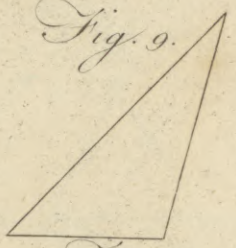
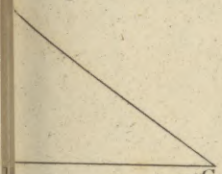


Fig. 10.



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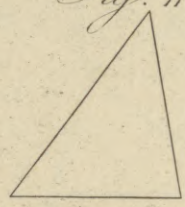
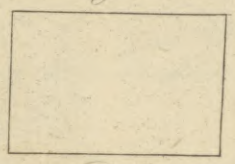


Fig. 12.

Fig. 13.



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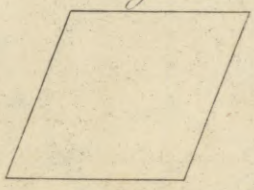

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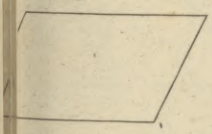

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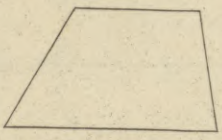

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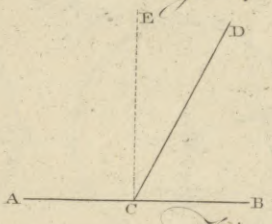

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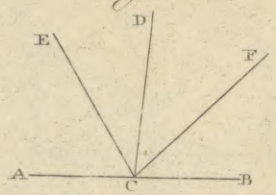

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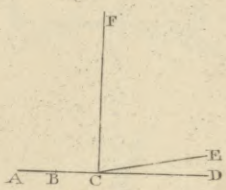

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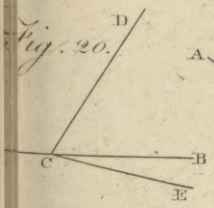

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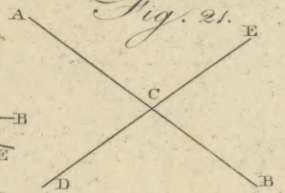

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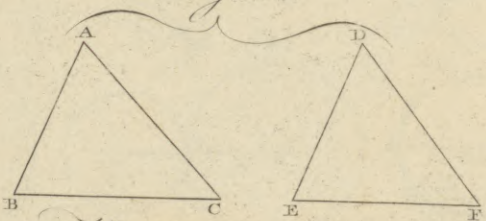

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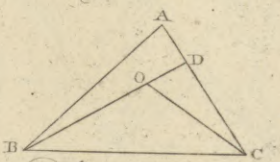

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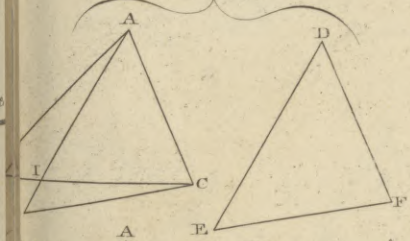

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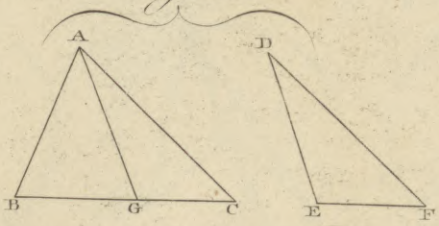

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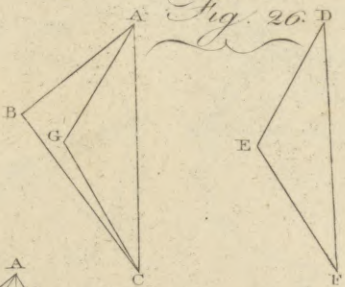
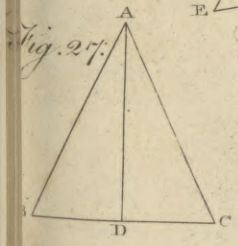


Fig. 27.



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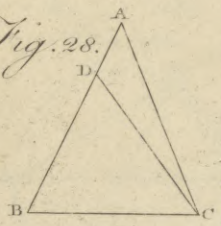
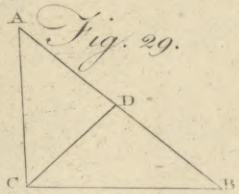


Fig. 29.



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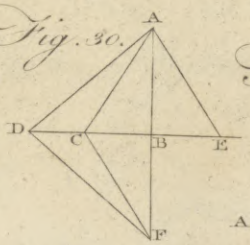

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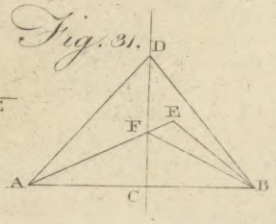

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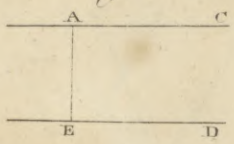
Fig. 32.

Fig. 33.



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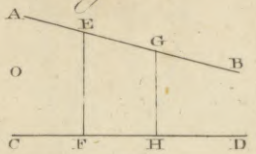

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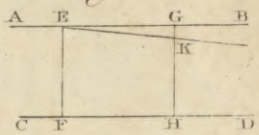

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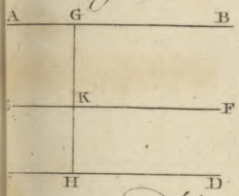

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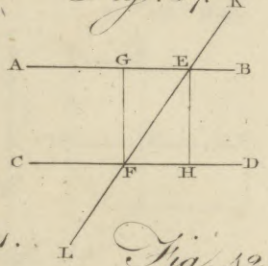

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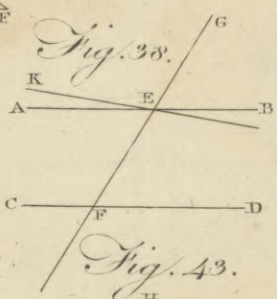

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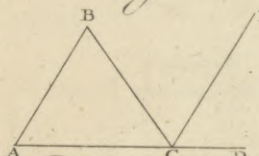

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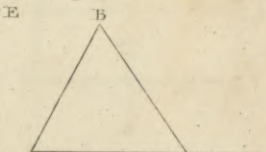

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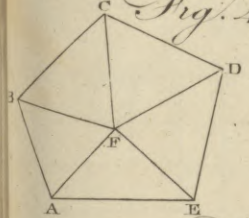

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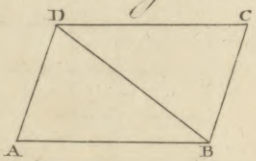

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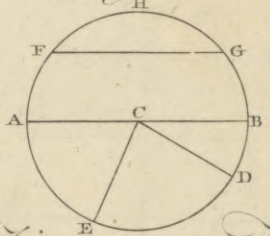

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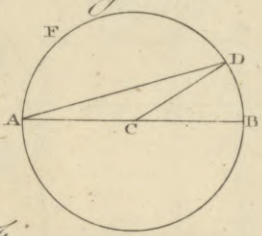
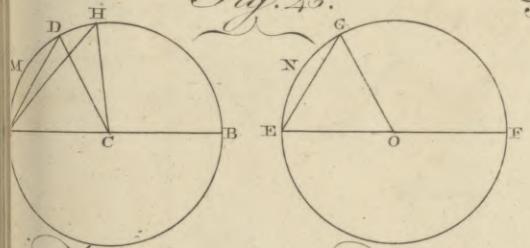


Fig. 46.

Fig. 45.



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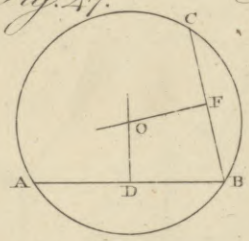

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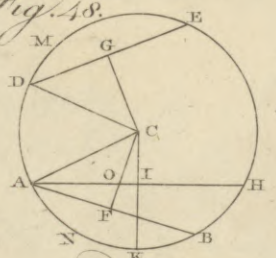
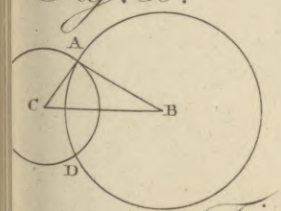


Fig. 49.

Fig. 50.



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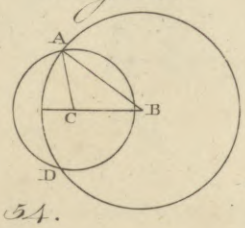

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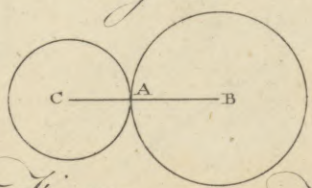

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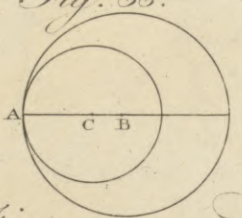
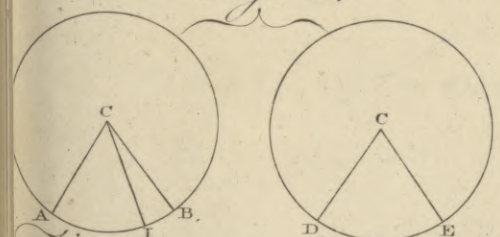


Fig. 57.

Fig. 54.



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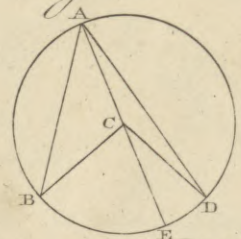

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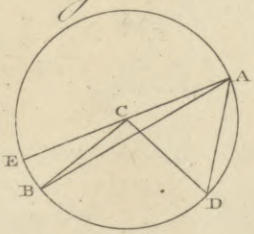

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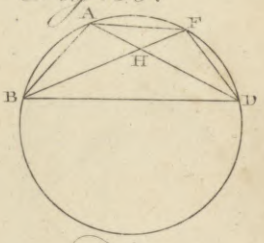

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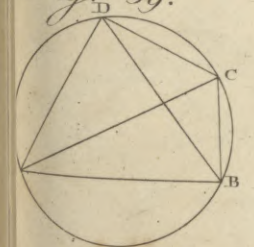

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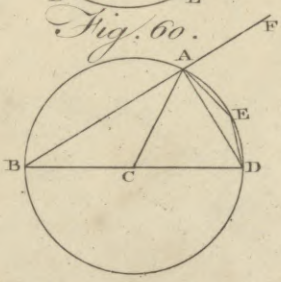

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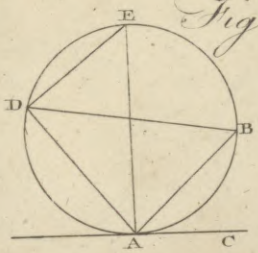

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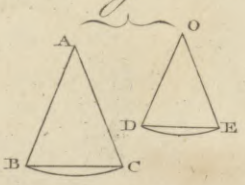

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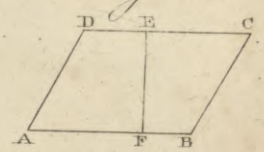

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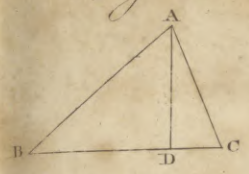
Fig. 64.



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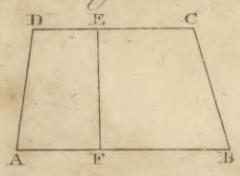

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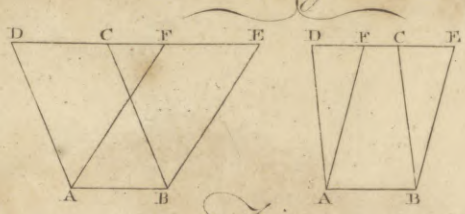

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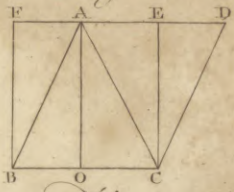

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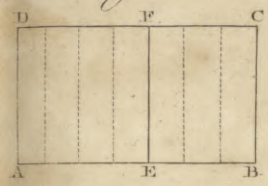

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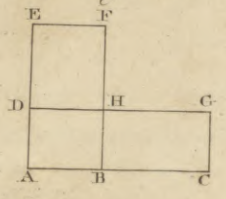

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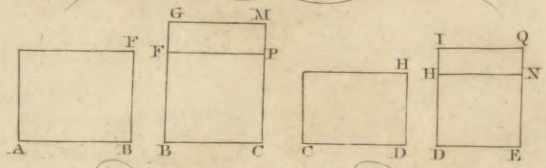
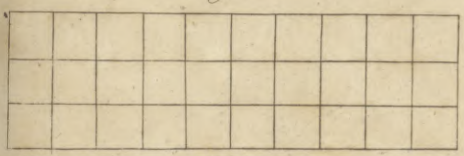


Fig. 71.

Fig. 72.



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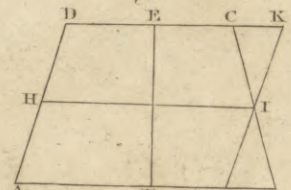

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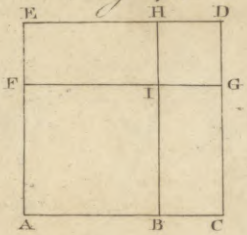

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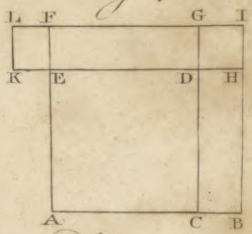
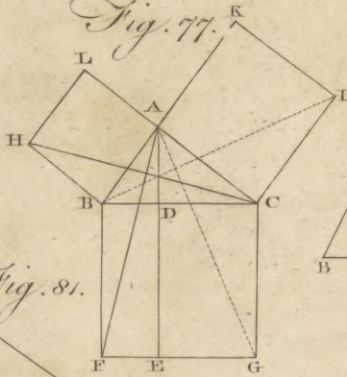


Fig. 76.

Fig. 77.



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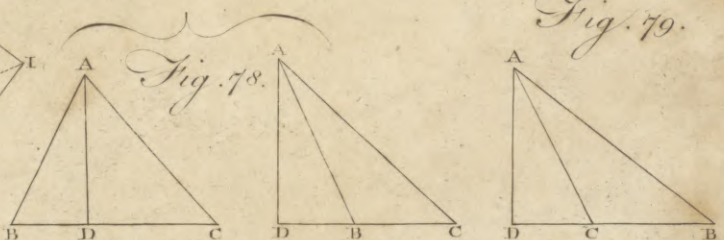
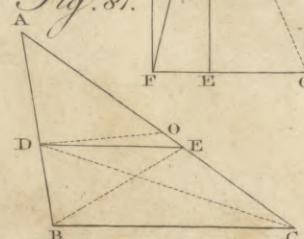


Fig. 79.

Fig. 80.

Fig. 81.



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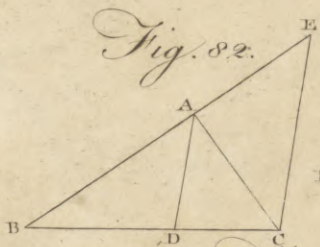

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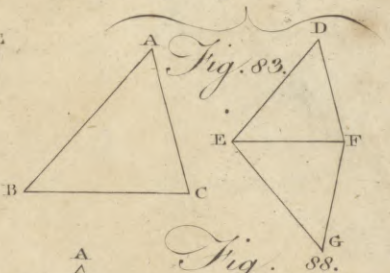

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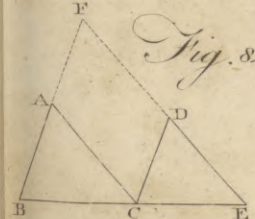

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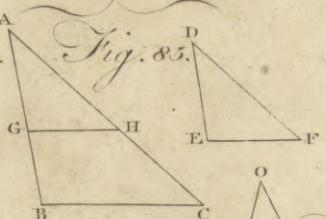

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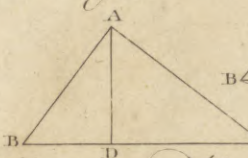

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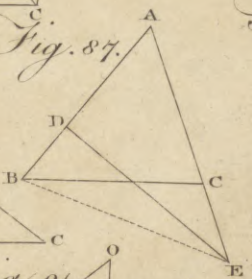

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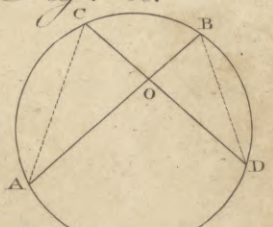

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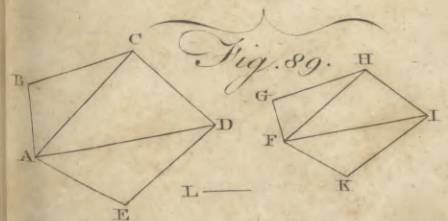

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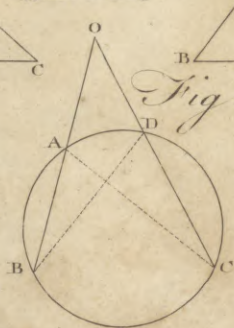

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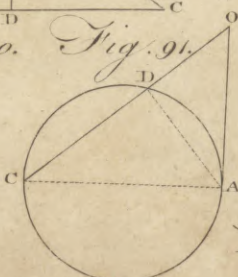

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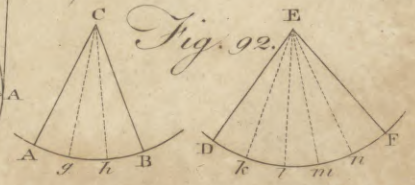

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Fig. 93.

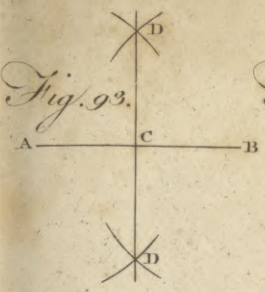
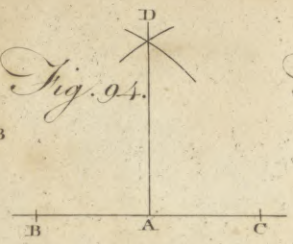


Fig. 94.



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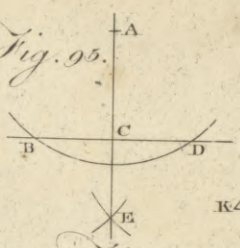

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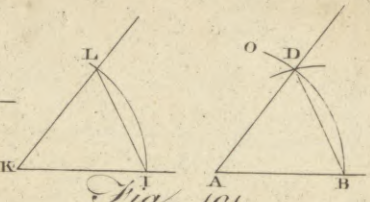

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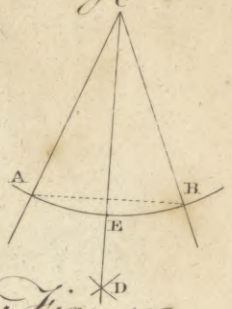

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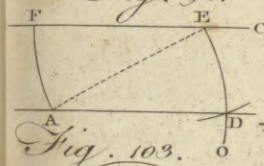

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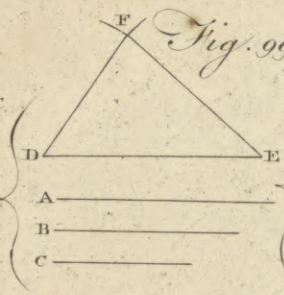

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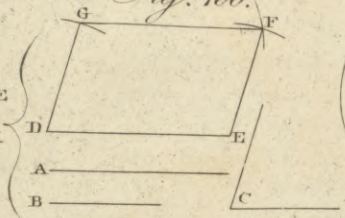

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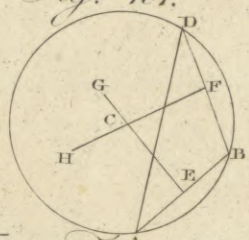
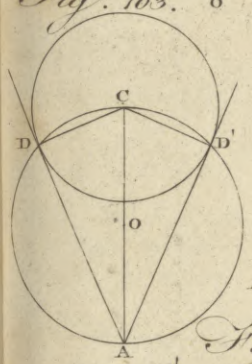


Fig. 102.

Fig. 103.



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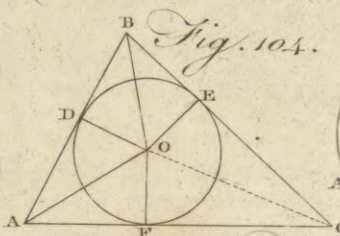

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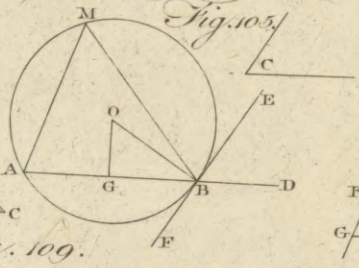

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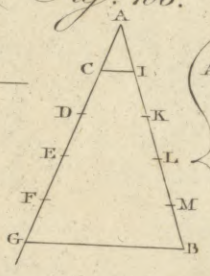

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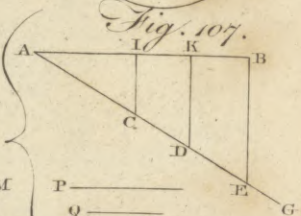

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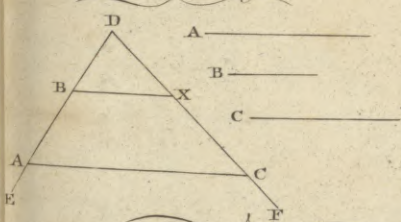

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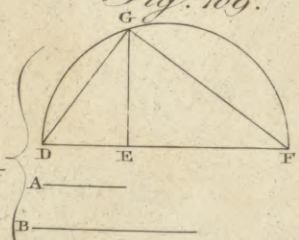

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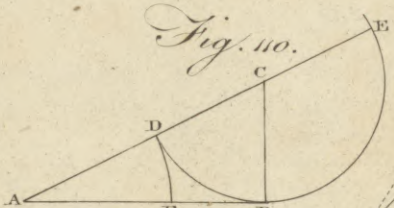

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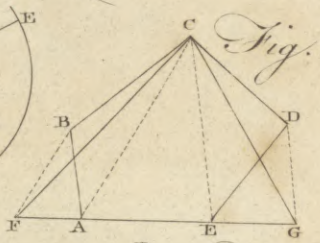

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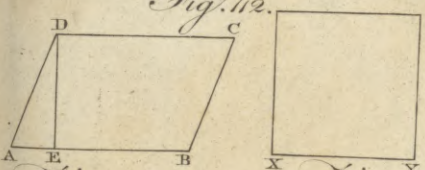

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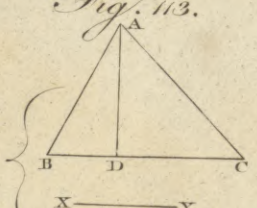

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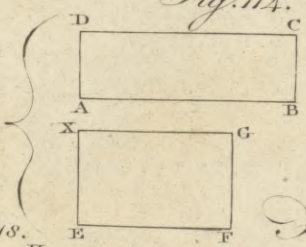

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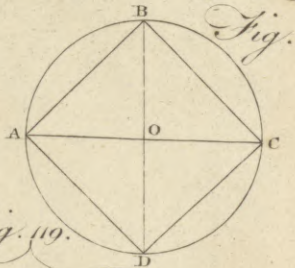

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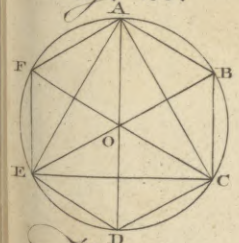

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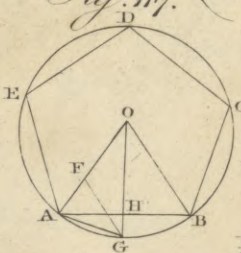

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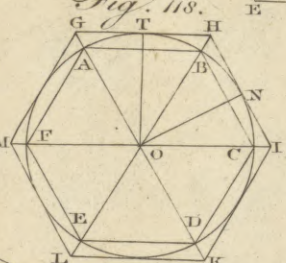

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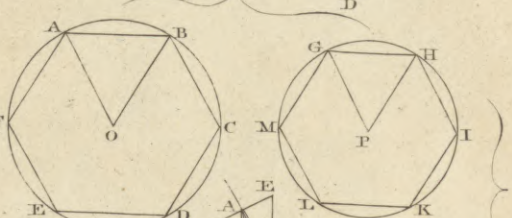

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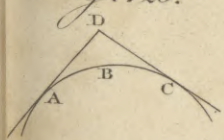

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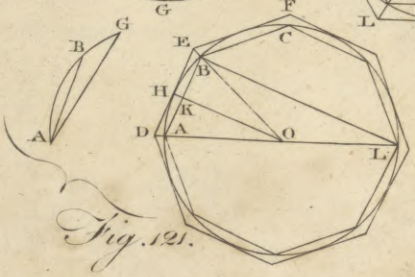

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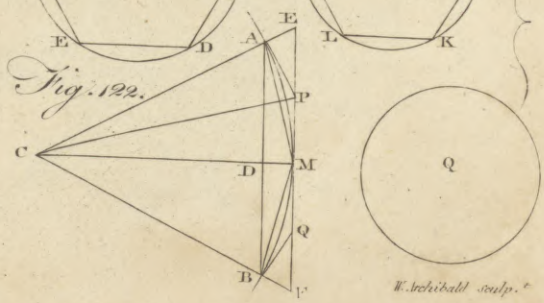
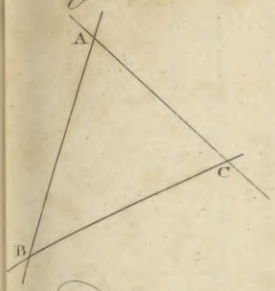


W. Archibald sculp.

Fig. 123.



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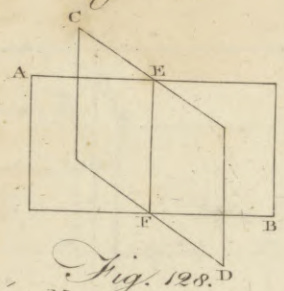

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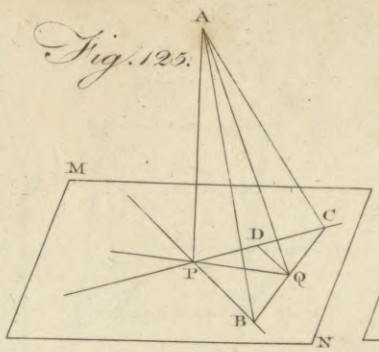

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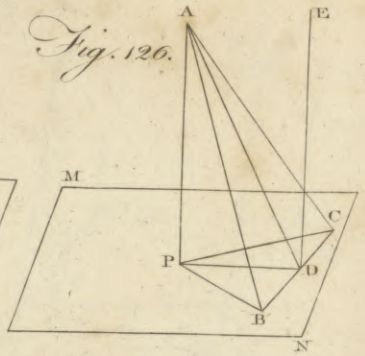

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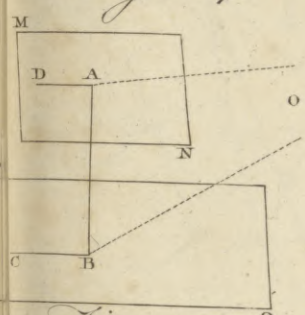

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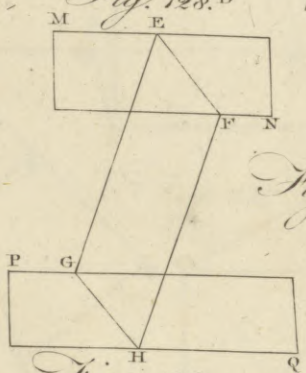

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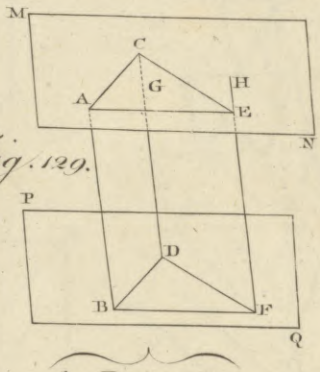

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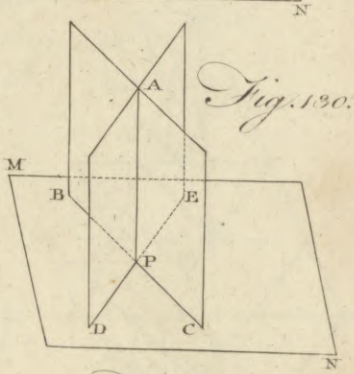

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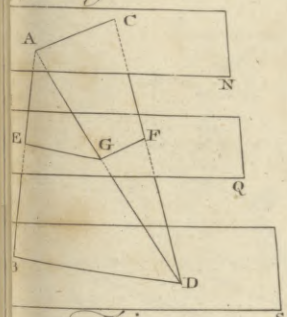

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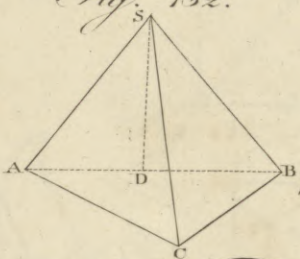

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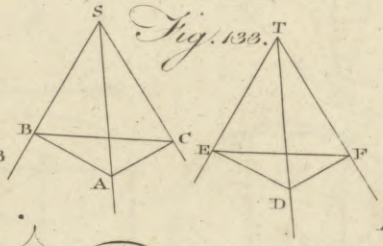

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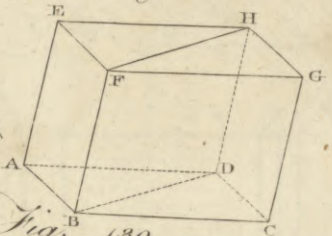

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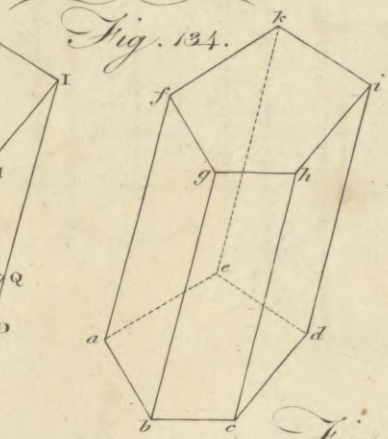

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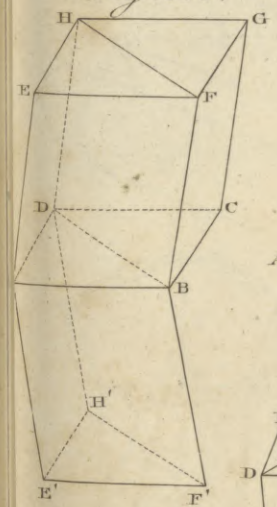

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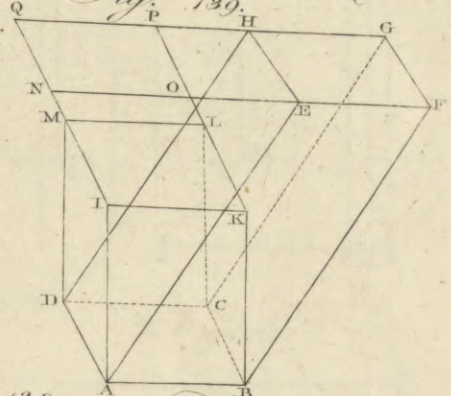

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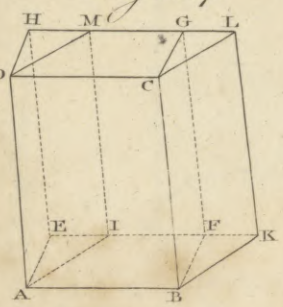

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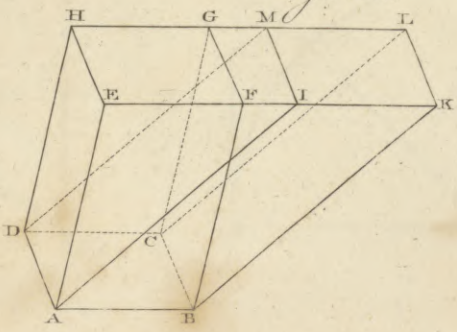

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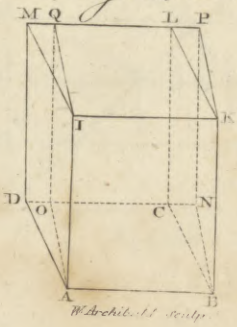
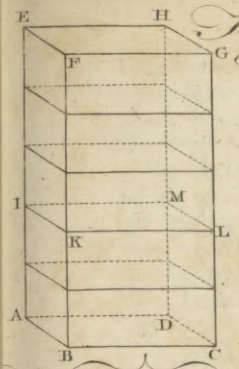


W. Archibald sculp.

Fig. 141.



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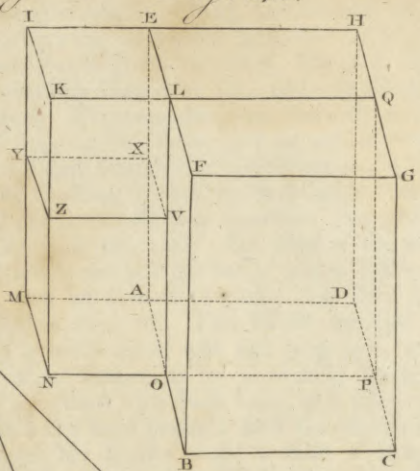

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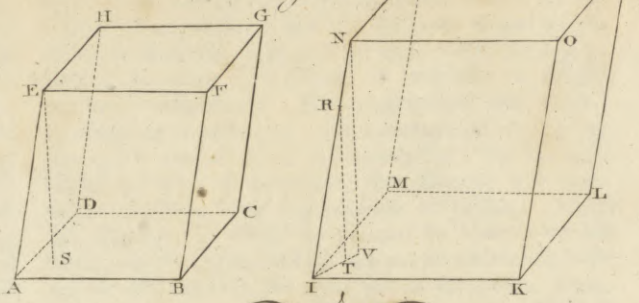

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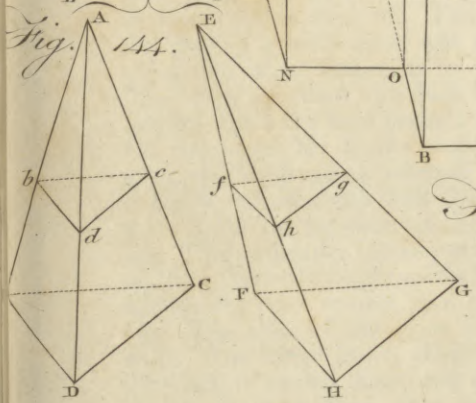

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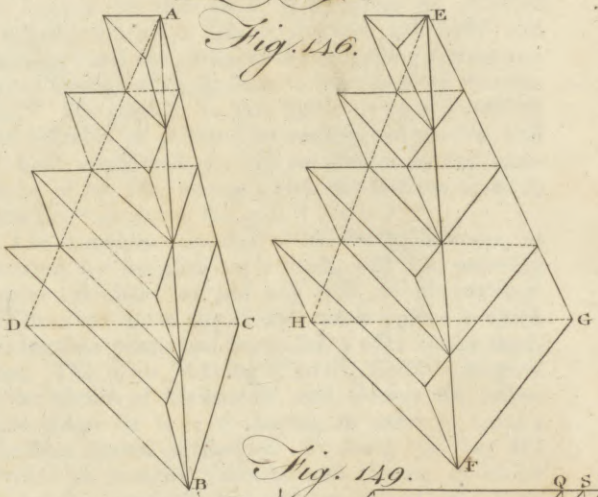

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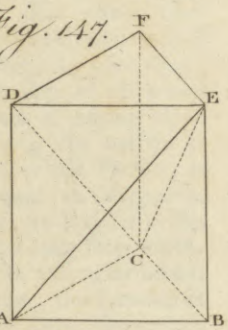

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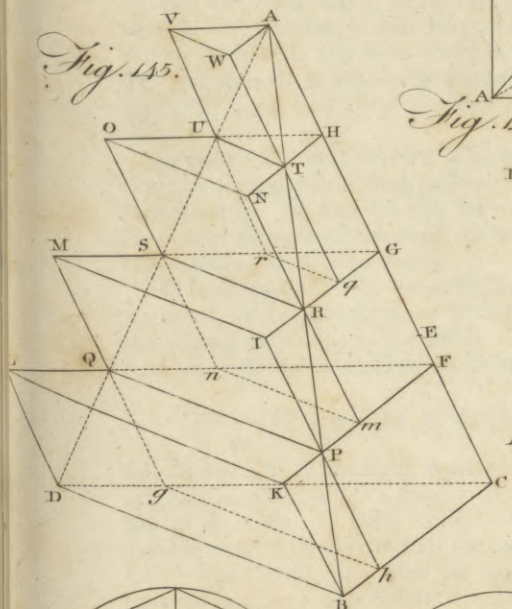

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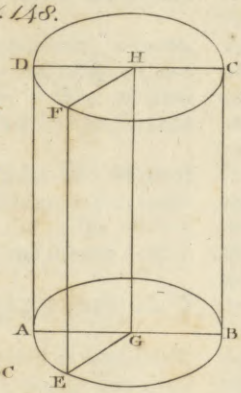

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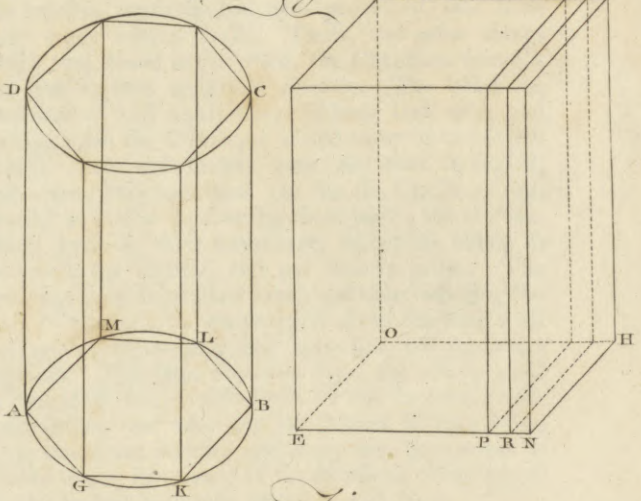

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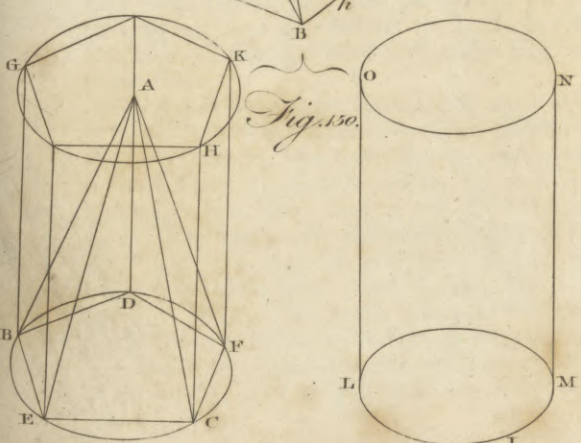

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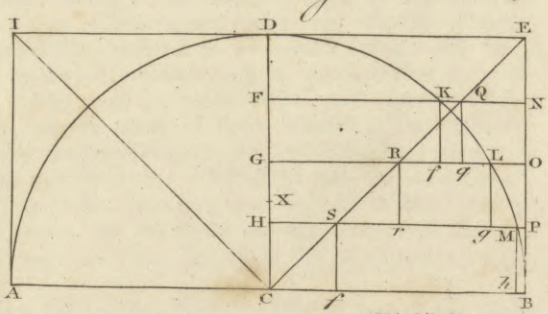
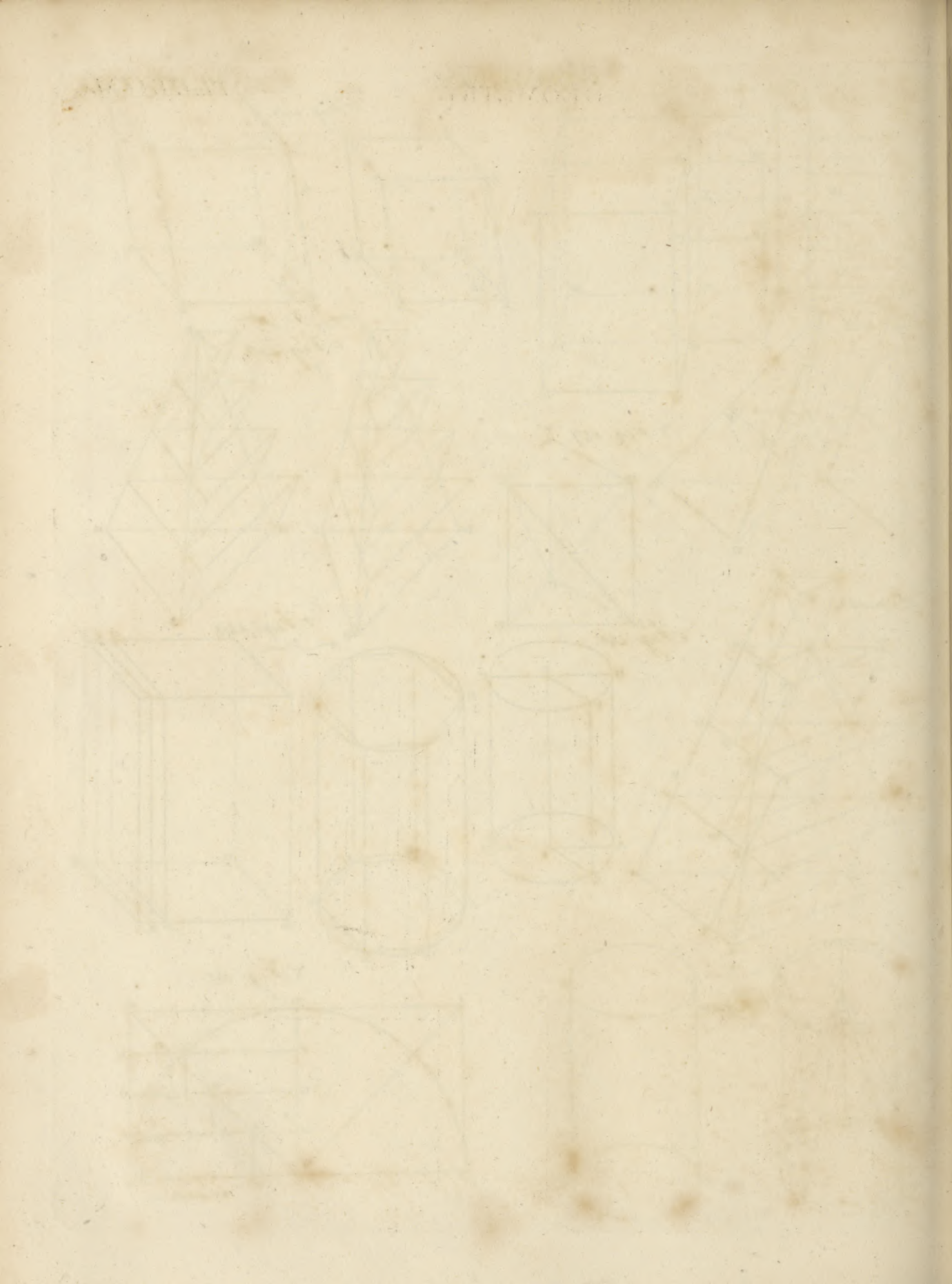


W. Archibald Sculp.



George. land, which is 900 leagues diſtant, and the only place beſides this where the cuſtom has been obſerved to prevail. Notwithſtanding this ceremony, however, very little real friendſhip ſeemed to take place on the part of the iſlanders. They crowded about the boats as the people were ſtepping into them, and ſeemed in doubt whether they ſhould detain them or let them go; at laſt, however, not thinking themſelves ſufficiently ſtrong, they ſeemed contented with their departure, and aſſiſted them in puſhing off their boats; but ſome of the moſt turbulent threw ſtones into the water, which fell very near them, and all ſeemed to glory that they had as it were driven them off. The Britiſh brought off five dogs of a white colour with fine long hair, with which the iſland ſeemed to be plentifully ſupplied. Theſe they purchaſed with ſmall nails, and ſome ripe bananas which had been brought from the Marqueſas. On this iſland Mr Forſter found a kind of ſcurvy-graſs, which the natives informed him they were wont to bruiſe and mix with ſhell fiſh; after which, they threw it into the ſea whenever they perceived a ſhoal of fiſh. This preparation intoxicates them for ſome time; and thus they are caught on the ſurface of the water without any other trouble than that of taking them out. The name of this plant among the natives is *enow*. The largeſt iſland, which they call *Tiookea*, is ſomething of an oval ſhape, and about 10 leagues in circuit; the other iſland, which lies two leagues to the weſtward of Tiookea, is four leagues long from north-eaſt to ſouth-weſt, and from three to five miles broad. The ſoil of both is extremely ſcanty; the foundation conſiſts of coral, very little elevated above the ſurface of the water.

GEORGE, St, or *GEORGE of Cappadocia*; a name whereby ſeveral orders, both military and religious, are denominated. It took its riſe from a ſaint or hero famous throughout all the Eaſt, called by the Greeks Μεγαλομαρτυς, q. d. *great martyr*.

On ſome medals of the emperors John and Manuel Comneni, we have the figure of St George armed, holding a ſword or javelin in one hand, and in the other a buckler, with this inſcription; an O, and therein a little P A, and ΓΕ—ΓΙΟ, making Ο ΑΓΙΟΣ ΓΕΟΡΓΙΟΣ, *O holy George*. He is generally repreſented on horſeback, as being ſuppoſed to have frequently engaged in combats in that manner. He is highly venerated throughout Armenia, Muſcovy, and all the countries which adhere to the Greek rite: from the Greek, his worſhip has long ago been received into the Latin church; and England and Portugal have both choſen him for their patron ſaint.

Great difficulties have been raiſed about this ſaint or hero. His very exiſtence has been called in queſtion. Dr Heylin, who wrote firſt and moſt about him, concluded with giving him entirely up, and ſuppoſing him only a ſymbolical device; and Dr Pettingal has turned him into a mere Baſilidian ſymbol of victory. Mr Pegg, in a paper in the Archæologia*, has attempted to reſtore him. And, finally, Mr Gibbon † has ſunk him into an Arian biſhop in the reigns of Conſtantius and Julian.—The biſhop alluded to,

GEORGE the Cappadocian, was ſo ſurnamed, according to our author, from his parents or education; and was born at Epiphania in Cilicia, in a fuller's ſhop. "From this obſcure and ſervile origin he raiſed himſelf by the talents of a paraſite: and the patrons, whom he aſſiduouſly flattered, procured for their worthleſs dependent a lucrative commiſſion, or contract, to ſupply the army with bacon. His employment was mean: he rendered it infamous. He accumulated wealth by the baſeſt arts of fraud and corruption; but his malverſations were ſo notorious, that George was compelled to eſcape from the purſuits of juſtice. After this diſgrace, in which he appears to have ſaved his fortune at the expence of his honour, he embraced, with real or affected zeal, the profeſſion of Arianiſm. From the love, or the oſtentation, of learning, he collected a valuable library of hiſtory, rhetoric, philoſophy, and theology; and the choice of the prevailing faction promoted George of Cappadocia to the throne of Athanaſius." His conduct in this ſtation is repreſented by our hiſtorian as polluted by cruelty and avarice, and his death conſidered as a juſt puniſhment for the enormities of his life, among which Mr Gibbon ſeems to rank his "enmity to the gods." George.

The immediate occaſion of his death, however, as narrated by eccleſiaſtical writers, will not probably appear calculated to add any ſtain to his memory. "There was in the city of Alexandria a place in which the heathen prieſts had been uſed to offer human ſacrifices. This place, as being of no uſe, Conſtantius gave to the church of Alexandria, and George the biſhop gave orders for it to be cleared, in order to build a Chriſtian church on the ſpot. In doing this they diſcovered an immenſe ſubterraneous cavern, in which the heathen myſteries had been performed, and in it were many human ſkulls. Theſe, and other things which they found in the place, the Chriſtians brought out and expoſed to public ridicule. The heathens, provoked at this exhibition, ſuddenly took arms and ruſhing upon the Chriſtians, killed many of them with ſwords, clubs and ſtones: ſome alſo they ſtrangled, and ſeveral they crucified. On this the Chriſtians proceeded no farther in clearing the temple; but the heathens, purſuing their advantage, ſeized the biſhop as he was in the church, and put him in priſon. The next day they deſpatched him; and then faſtening the body to a camel, he was dragged about the ſtreets all day, and in the evening they burnt him and the camel together. This fate, Sozomen ſays, the biſhop owed in part to his haughtineſs while he was in favour with Conſtantius, and ſome ſay the friends of Athanaſius were concerned in this maſſacre; but he aſcribes it chiefly to the inveteracy of the heathens, whoſe ſuperſtitions he had been very active in aboliſhing.

This George, the Arian biſhop of Alexandria, was a man of letters, and had a very valuable library, which Julian ordered to be ſeized for his own uſe; and in his orders concerning it, he ſays that many of the books were on philoſophical and rhetorical ſubjects, though many of them related to the doctrine of the impious Galilæans (as in his ſneering contemptuous way he always affected to call the Chriſtians). 'Theſe books (ſays he) I could wiſh to have utterly deſtroyed; but leſt books of value ſhould be deſtroyed along with them, let thoſe alſo be carefully ſought for.'

But Mr Gibbon gives a different turn to the affair

* Vol. i. p. 1.
† Hiſt. vol. ii. p. 404.

George. of George's murder, as well as relates it with different circumſtances. "The Pagans (ſays he) excited his devout avarice; and the rich temples of Alexandria were either pillaged or inſulted by the haughty prelate, who exclaimed, in a loud and threatening tone, 'How long will theſe ſepulchres be permitted to ſtand?' Under the reign of Conſtantius, he was expelled by the fury, or rather by the juſtice of the people: and it was not without a violent ſtruggle, that the civil and military powers of the ſtate could reſtore his authority, and gratify his revenge. The meſſenger who proclaimed at Alexandria the acceſſion of Julian, announced the downfal of the archbiſhop. George, with two of his obſequious miniſters, Count Diodorus and Darcontius maſter of the mint, was ignominiouſly dragged in chains to the public priſon. At the end of 24 days, the priſon was forced open by the rage of a ſuperſtitious multitude, impatient of the tedious forms of judicial proceedings. The *enemies of gods* and men expired under their cruel inſults; the lifeleſs bodies of the archbiſhop and his aſſociates were carried in triumph through the ſtreets on the back of a camel; and the inactivity of the Athanaſian party was eſteemed a ſhining example of evangelical patience. The remains of theſe guilty wretches were thrown into the ſea; and the popular leaders of the tumult declared their reſolution to diſappoint the devotion of the Chriſtians, and to intercept the future honours of theſe martyrs, who had been puniſhed like their predeceſſors, by the enemies of their religion. The fears of the Pagans were juſt, and their precautions ineffectual. The meritorious death of the archbiſhop obliterated the memory of his life. The rival of Athanaſius was dear and ſacred to the Arians, and the ſeeming converſion of thoſe ſectaries introduced his worſhip into the boſom of the Catholic church. The odious ſtranger, diſguiſing every circumſtance of time and place, aſſumed the maſk of a martyr, a ſaint, and a Chriſtian hero; and the infamous George of Cappadocia has been transformed into the renowned St George of England, the patron of arms, of chivalry, and of the Garter."

Knights of St GEORGE. See GARTER. There have been various other orders under this denomination, moſt of which are now extinct; particularly one founded by the emperor Frederic III. in the year 1470, to guard the frontiers of Bohemia and Hungary againſt the Turks; another, called *St George of Alfama*, founded by the kings of Arragon; another in Auſtria and Carinthia; and another in the republic of Genoa, ſtill ſubſiſting, &c.

Religious of St GEORGE. Of theſe there are divers orders and congregations; particularly canons regular of St George in Alga, at Venice, eſtabliſhed by authority of Pope Boniface IX. in the year 1404. The foundation of this order was laid by Bartholomew Colonna, who preached in 1396, at Padua, and ſome other villages in the ſtate of Venice. Pope Pius V. in 1570, gave theſe canons precedence of all other religious. Another congregation of the ſame inſtitute in Sicily, &c.

St GEORGE *del Mina*, the capital of the Dutch ſettlements on the Gold coaſt of Guinea, ſituated ſeven or eight miles weſt of Cape-coaſt caſtle the capital of the Britiſh ſettlements there. W. Long. 5′. and N. Lat. 5°. George.

ST GEORGE, a fort and town of Aſia, in the peninſula on this ſide the Ganges, and on the coaſt of Coromandel, belonging to the Britiſh; it is otherwiſe called *Madras*, and by the natives *Chilipatam*. It fronts the ſea, and has a ſalt water river on its back ſide, which hinders the freſh water ſprings from coming near the town, ſo that they have no good water within a mile of them. In the rainy ſeaſons it is incommoded by inundations; and from April to September, it is ſo ſcorching hot, that if the ſea breezes did not cool the air, there would be no living there. There are two towns, one of which is called the *White Town*, which is walled round, and has ſeveral bulwarks and baſtions to defend it: it is 400 paces long and 150 broad, and is divided into regular ſtreets. Here are two churches, one for the Proteſtants, and the other for the Papiſts; as alſo a good hoſpital, a town hall, and a priſon for debtors. They are a corporation, and have a mayor and aldermen, with other proper officers. The *Black Town* is inhabited by Gentoos, Mahometans, and Portugueſe and Armenian Chriſtians, and each religion has its temples and churches. This, as well as the White Town, is ruled by the Engliſh governor and his council. The diamond mines are but a week's journey from this place, which renders them pretty plentiful, but there are no large ones ſince that great diamond was procured by Governor Pitt. This colony produces very little of its own growth or manufacture for foreign markets, and the trade is in the hands of the Armenians and Gentoos. The chief things the Britiſh deal in, beſides diamonds, are calicoes, chintz, muſlins, and the like. This colony may conſiſt of 80,000 inhabitants in the towns and villages, and there are generally 400 or 500 Europeans. Their rice is brought by ſea from Gangam and Orixa, their wheat from Surat and Bengal, and their fire wood from the iſlands of Diu; ſo that an enemy, with a ſuperior force at ſea, may eaſily diſtreſs them. The houſes of the White Town are built with brick, and have lofty rooms and flat roofs; but the Black Town conſiſts chiefly of thatched cottages. The military power is lodged in the governor and council, who are alſo the laſt reſort in civil cauſes. The company have two chaplains, who officiate by turns, and have each 100l. a-year, beſides the advantages of trade. They never attempt to make proſelytes, but leave that to the Popiſh miſſionaries. The ſalaries of the Company's writers are very ſmall: but if they have any fortune of their own, they may make it up by trade; which muſt generally be the caſe, for they commonly grow rich. It was taken by the French in 1746, who reſtored it at the peace of Aix-la-Chapelle. George.

St GEORGE'*s*, the largeſt of the Bermuda or Summer iſlands. W. Long. 65. 10. N. Lat. 32. 30.

Croſs of ST GEORGE, a red one in a field argent, which makes part of the Britiſh ſtandard.

GEORGE, a lake in Eaſt Florida, alſo denominated Great lake, about 15 miles broad, and 20 feet deep. There are ſome beautiful iſlands in it, the largeſt of which is about two miles broad, commanding a delightful and very extenſive proſpect. There are manifeſt traces of a large town of the aborigines, and the

George || Georgia.

the iſland itſelf appears to have been the favourite reſidence of an Indian prince. It lies to the ſouth of Lake Champlain, and its waters lie about 100 feet higher. It abounds with fiſhes of a ſuperior quality, ſuch as the Oſwego baſs, and ſpeckled trouts of conſiderable magnitude. The French at one period called it Lake Sacrament, as they were at the trouble to bring from it their water for ſacramental purpoſes, to the churches they had planted in Canada.

GEORGETOWN, the name of ſeveral towns in America, ſuch, for inſtance, as Georgetown in Maryland, about 65 miles S. W. of Philadelphia; Georgetown in the county of Lincoln, and diſtrict of Maine, lying on both ſides of Kennebeck river, 148 miles S. W. of Philadelphia, where the Roman Catholics have a very flouriſhing college: it is the name of a village in Fayette county, Pennſylvania, where a number of boats are annually built; and of a poſt town in the diſtrict of the ſame name, where the Epiſcopalians, Baptiſts, and Methodiſts, have each a place of worſhip, although the number of houſes in it does not much exceed 300, which are conſtructed chiefly of wood. It lies 127 miles S. W. of Wilmington, and 681 from Philadelphia.

GEORGIA, a country of Aſia, bounded on the north by Circaſſia, on the eaſt by Dagheſtan and Shirvan, on the ſouth by Armenia, and on the weſt by the Euxine or Black ſea; comprehending the greateſt part of the ancient Colchis, Iberia, and Albania. About the etymon of the name of this country, authors are not agreed. The moſt probable opinion is, that it is a corruption by ſoftening of *Kurgia*, from the river Kur; whence alſo it is ſuppoſed that the inhabitants are called by the Perſians indifferently *Gurgi* and *Kurgi;* and the country *Kurgiſtan* and *Gurgiſtan:* It is divided by a ridge of mountains into eaſtern and weſtern; the former of which is again ſubdivided into the kingdoms of Caket, Carduel or Carthuel, and Goguetia; and the latter into the provinces of Abcaſſia, Mireta or Imeretia, and Guriel. Another diviſion is into Georgia Proper, Abcaſſia, and Mingrelia. A third diviſion will be afterwards mentioned.

"Georgia, (ſays Sir George Chardin) is as fertile a country as can be ſeen; the bread is as good here as in any part of the world; the fruit of an exquiſite flavour and of different ſorts: no place in Europe yields better pears and apples, and no place in Aſia better pomegranates. The country abounds with cattle, veniſon, and wild fowl of all ſorts: the river Kur is well ſtocked with fiſh; and the wine is ſo rich, that the king of Perſia has always ſome of it for his own table. The inhabitants are robuſt, valiant, and of a jovial temper; great lovers of wine, and eſteemed very truſty and faithful; endowed with good natural parts, but, for want of education, very vicious. The women are generally ſo fair and comely, that the wives and concubines of the king of Perſia and his court are for the moſt part Georgian women. Nature has adorned them with graces nowhere elſe to be met with: it is impoſſible to ſee them without loving them; they are of a good ſize, clean limbed, and well ſhaped. Another traveller, however, of no mean character, thus expreſſes himſelf with reſpect to the women: "As to the Georgian women, they did not at all ſurpriſe us; for we expected to find them perfect beauties. They are, indeed no way diſagreeable; and may be counted beauties, if compared with the Curdes. They have an air of health that is pleaſing enough; but, after all, they are neither ſo handſome nor ſo well ſhaped as is reported. Thoſe who live in the towns have nothing extraordinary more than the others; ſo that I may, I think, venture to contradict the accounts that have been given of them by moſt travellers." Georgia.

This country formerly abounded with great cities, as appears not only from its hiſtory, but from the ruins of many of them ſtill viſible, which ſhow that they muſt have been very large, opulent, and magnificently built. Theſe were all deſtroyed by the inundations of northern barbarians from Mount Caucaſus, as the Alans, Huns, Suevi, and ſome others, ſo much noted in hiſtory for their ſtrength, courage, and conqueſts.

The lateſt diviſion of this country is into nine provinces; five of which are ſubject to the famous prince Heraclius, forming what is commonly called the kingdom of Georgia; and four are under the dominion of David, compoſing the kingdom or principality of Imeretia. See IMERETIA.

This whole country is ſo extremely beautiful, that ſome fanciful travellers have imagined they had here found the ſituation of the original garden of Eden. The hills are covered with foreſts of oak, aſh, beech, cheſnuts, walnuts, and elms, encircled with vines, growing perfectly wild, but producing vaſt quantities of grapes. From theſe is annually made as much wine as is neceſſary for the yearly conſumption; the remainder is left to rot on the vines. Cotton grows ſpontaneouſly, as well as the fineſt European fruit trees. Rice, wheat, millet, hemp, and flax, are raiſed on the plains, almoſt without culture. The valleys afford the fineſt paſturage in the world; the rivers are full of fiſh; the mountains abound in minerals, and the climate is delicious; ſo that nature appears to have laviſhed on this favourite country every production that can contribute to the happineſs of its inhabitants.

On the other hand, the rivers of Georgia being fed by mountain torrents, are at all ſeaſons either too rapid or too ſhallow for the purpoſes of navigation: the Black ſea, by which commerce and civilization might be introduced from Europe, has been till very lately in the excluſive poſſeſſion of the Turks: the trade of Georgia by land is greatly obſtructed by the high mountains of Caucaſus; and this obſtacle is ſtill increaſed by the ſwarms of predatory nations, by which thoſe mountains are inhabited.

It is ſaid, that in the 15th century, a king of Georgia divided among his five ſons the provinces of Carduel and Caket, Imeretia, Mingrelia, Guriel, and Abcaſſia. Theſe petty princes were too jealous to unite for their common defence, and too weak ſingly to reſiſt a foreign enemy, or even to check the encroachments of their great vaſſals, who ſoon became independent. By forming a party among theſe nobles, the Turks gradually gained poſſeſſion of all the weſtern provinces, while the Perſians occupied the governments of Carduel and Caket. Since that period the many unſucceſsful attempts of the Georgians to recover their liberty have repeatedly produced the deva-ſtation of their country. Abbas the Great is ſaid to have carried off in one expedition from the provinces of

Georgia. of Carduel and Caket no leſs than 80,000 families; a number which, probably, exceeds the whole actual population of thoſe provinces. The moſt horrible cruelties were again exerciſed on the unhappy people, at the beginning of the preſent century, by the mercileſs Nadir; but theſe were trifling evils, compared with thoſe ariſing from the internal diſſenſions of the great barons. This numerous body of men, idle, arrogant, and ferocious, poſſeſſed of an unlimited power over the lives and properties of their vaſſals, having no employment but that of arms, and no hopes of aggrandizing themſelves but by the plunder of their rivals, were conſtantly in a ſtate of warfare; and as their ſucceſs was various, and the peaſants of the vanquiſhed were conſtantly carried off and ſold to the Turks or Perſians, every expedition increaſed the depopulation of the country. At length they invited the neighbouring mountaineers, by the hopes of plunder, to take part in their quarrels; and theſe dangerous allies, becoming acquainted with the country, and being ſpectators of the weakneſs of its inhabitants, ſoon completed its deſolation. A few ſqualid wretches, half naked, half ſtarved, and driven to deſpair by the mercileſs exactions of their landlords, are thinly diſperſed over the moſt beautiful provinces of Georgia. The revolutions of Perſia, and the weakneſs of the Turks, have indeed enabled the princes of the country to recover their independence; but the ſmallneſs of their revenue has hitherto diſabled them from repreſſing effectually the tyranny of the nobles, and relieving the burdens of the peaſants.

The capital of Georgia is Teflis, where Prince Heraclius reſides (See TEFLIS). Of this prince, ſo celebrated for his exploits and ſucceſs in ſhaking off the Ottoman yoke, we have the following account by the late Profeſſor Guldenſtaedt when he travelled into theſe parts in 1770. "Heraclius, or, as he is called, the Tzar Iracli, is above 60 years old, of a middle ſize, with a long countenance, a dark complexion, large eyes, and a ſmall beard. He paſſed his youth at the court and in the army of the celebrated Nadir Shah, where he contracted a fondneſs for Perſian cuſtoms and manners, which he has introduced into his kingdom. He has ſeven ſons and ſix daughters. He is much revered and dreaded by the Perſian khans his neighbours; and is uſually choſen to mediate between them in their diſputes with each other. When they are at war, he ſupports one of the parties with a few troops, who diffuſe a ſpirit and courage among the reſt, becauſe the Georgian ſoldiers are eſteemed the braveſt of thoſe parts; and Prince Heraclius himſelf is renowned for his courage and military ſkill. When on horſeback he has always a pair of loaded piſtols at his girdle, and, if the enemy is near, a muſket ſlung over his ſhoulder. In all engagements he is the foremoſt to give examples of perſonal bravery; and frequently charges the enemy at the head of his troops with the ſabre in his hand. He loves pomp and expence; he has adopted the dreſs of Perſia; and regulates his court after the manner of that country. From the example of the Ruſſian troops, who were quartered in Georgia during the laſt Turkiſh war, he has learnt the uſe of plates, knives, and forks, diſhes and houſehold furniture, &c."

The ſubjects of Heraclius are eſtimated at about 60,000 families; but this, notwithſtanding the preſent deſolated ſtate of the country, is probably an under valuation. The peaſants belonging to the queen, and thoſe of the patriarch, pay no tax to the prince, and therefore do not appear on the books of the revenue officers. Many ſimilar exemptions have likewiſe been granted by the prince to his ſons-in-law, and his favourites. Beſides, as the impoſt on the peaſants is not a poll-tax, but a tax on hearths, the inhabitants of a village, on the approach of the collectors, frequently carry the furniture of ſeveral huts into one, and deſtroy the remainder, which are afterwards very eaſily replaced. It is probable, therefore, that the population of Georgia does not fall ſhort of 350,000 ſouls. The revenues may be eſtimated at about 150,000 rubles, or 26,250l. They conſiſt of, 1. The cuſtoms, farmed at 1750l.—2. Rent paid by the farmers of the mint, at Teflis, 1750l.—3. The tribute paid by the khans of Erivan and Ganſha, 7000l.—and, 4. The hearth money levied on the peaſants, amounting to 15,750l. The common coins here are the abaſſes, of about 15d. value, and a ſmall copper coin, ſtamped at the mint at Teflis. Beſides theſe, a large quantity of gold and ſilver money is brought into the country from Perſia and Turkey, in exchange for honey, butter, cattle, and blue linens. Georgia

The government of Georgia is deſpotic; but, were it not for the aſſiſtance of the Ruſſian troops, the prince would be frequently unable to carry his decrees into execution. The puniſhments in criminal caſes are ſhockingly cruel; fortunately they are not frequent, becauſe it is ſeldom difficult to eſcape into ſome of the neighbouring countries, and becauſe the prince is more enriched by confiſcating the property of the criminal, than by putting him to torture. Judicial combats are conſidered as the privilege of nobility, and take place when the cauſe is extremely intricate, or when the power and intereſt of two claimants are ſo equal, that neither can force a deciſion of the court in his favour. This mode of trial is called an appeal to the judgment of God.

The dreſs of the Georgians nearly reſembles that of the Coſſacks; but men of rank frequently wear the habit of Perſia. They uſually dye their hair, beard, and nails with red. The Georgian women employ the ſame colour to ſtain the palms of their hands. On their heads they wear a cap or fillet, under which their black hair falls on their forehead: behind it is braided into ſeveral treſſes. Their eyebrows are painted with black, in ſuch a manner as to form one entire line, and their faces are perfectly coated with white and red. Their robe is open to the girdle, ſo that they are reduced to conceal their breaſts with their hands. Their air and manner are extremely voluptuous. Being generally educated in convents, they can all read and write; a qualification which is very unuſual among the men, even of the higheſt rank. Girls are betrothed as ſoon as poſſible, often at three or four years of age. In the ſtreets the women of rank are always veiled, and then it is indecent in any man to accoſt them. It is likewiſe uncivil in converſation to inquire after the wives of any of the company. Theſe, however, are not ancient cuſtoms, but are a conſequence of the violences committed by the Perſians, under Shah Nadir.

Georgia. Travellers accuſe the Georgians of drunkenneſs, ſuperſtition, cruelty, ſloth, avarice, and cowardice; vices which are everywhere common to ſlaves and tyrants, and are by no means peculiar to the natives of this country. The deſcendants of the coloniſts, carried off by Shah Abbas, and ſettled at Peria, near Iſpahan, and in Maſanderan, have changed their character with their government; and the Georgian troops, employed in Perſia againſt the Affghans, were advantageouſly diſtinguiſhed by their docility, their diſcipline, and their courage.

The other inhabitants of Georgia are Tartars, Oſſi, and Armenians, called in the Georgian language Somakhi. Theſe laſt are found all over Georgia, ſometimes mixed with the natives, and ſometimes in villages of their own. They ſpeak among themſelves their own language, but all underſtand and can talk the Georgian. Their religion is partly the Armenian, and partly the Roman Catholic. They are the moſt oppreſſed of the inhabitants, but are ſtill diſtinguiſhed by that inſtinctive induſtry which everywhere characterizes the nation.

Beſides theſe, there are in Georgia conſiderable numbers of Jews, called, in the language of the country, Uria. Some have villages of their own; and others are mixed with the Georgian, Armenian, and Tartar inhabitants, but never with the Oſſi. They pay a ſmall tribute above that of the natives.

GEORGIA, one of the United States of America, lying between South Carolina and Florida. It extends 120 miles upon the ſea-coaſt, and 300 miles from thence to the Apalachian mountains, and its boundaries to the north and ſouth are the rivers Savannah and Alatamaha. The whole coaſt is bordered with iſlands; the principal of which are Skidaway, Waſſaw, Oſſabaw, St Catherine's, Sapelo, Frederica, Jekyl, Cumberland, and Amelia.

The ſettlement of a colony between the rivers Savannah and Alatamaha was meditated in England in 1732, for the accommodation of poor people in Great Britain and Ireland, and for the further ſecurity of Carolina. Private compaſſion and public ſpirit conſpired to promote the benevolent deſign. Humane and opulent men ſuggeſted a plan of tranſporting a number of indigent families to this part of America free of expence. For this purpoſe they applied to the king, George II. and obtained from him letters patent, bearing date June 9, 1732, for legally carrying into execution what they had generouſly projected. They called the new province *Georgia*, in honour of the king, who encouraged the plan. A corporation, conſiſting of 21 perſons, was conſtituted by the name of, The Truſtees for ſettling and eſtabliſhing the colony of Georgia.

In November 1732, 116 ſettlers embarked for Georgia to be conveyed thither free of expence, furniſhed with every thing requiſite for building and for cultivating the ſoil. Mr James Oglethorpe, one of the truſtees, and an active promoter of the ſettlement, embarked as the head and director of theſe ſettlers. They arrived at Charleſtown early in the next year. Mr Oglethorpe, accompanied by William Bull, ſhortly after his arrival, viſited Georgia; and after ſurveying the country, marked the ſpot on which Savannah now ſtands, as the fitteſt to begin their ſettlement. Here they accordingly began and built a ſmall fort, and a Georgia. number of ſmall huts for their defence and accommodation. Such of the ſettlers as were able to bear arms were embodied, and well appointed with officers, arms, and ammunition. A treaty of friendſhip was concluded between the ſettlers and their neighbours the Creek Indians, and every thing wore the aſpect of peace and future proſperity. But the fundamental regulations eſtabliſhed by the truſtees of Georgia were ill adapted to the circumſtances and ſituation of the poor ſettlers, and of pernicious conſequences to the proſperity of the province. Yet although the truſtees were greatly miſtaken with reſpect to their plan of ſettlement, it muſt be acknowledged their views were generous. Like other diſtant legiſlators, who framed their regulations upon principles of ſpeculation, they were liable to many errors and miſtakes; and however good their deſign, their rules were found improper and impracticable. Theſe injudicious regulations and reſtrictions, the wars in which they were involved with the Spaniards and Indians, and the frequent inſurrections among themſelves, threw the colony into a ſtate of confuſion and wretchedneſs too great for human nature long to endure. Their oppreſſed ſituation was repreſented to the truſtees by repeated complaints; till at length finding that the province languiſhed under their care, and weary with the complaints of the people, they in the year 1752 ſurrendered their charter to the king, and it was made a royal government.

—In the year 1740, the Rev. George Whitefield founded an orphan houſe academy in Georgia about 12 miles from Savannah. Mr Whitefield died at Newbury port, in New England, in October 1770, in the 56th year of his age, and was buried under the Preſbyterian church in that place. From the time Georgia became a royal government in 1752 till the peace of Paris in 1763, ſhe ſtruggled under many difficulties, ariſing from the want of credit and friends, and the frequent moleſtations of enemies. The good effects of the peace were ſenſibly felt in the province of Georgia. From this time it began to flouriſh under the fatherly care of Governor Wright. To form a judgment of the rapid growth of the colony, we need only attend to its exports. In the year 1763, they conſiſted of 7500 barrels of rice, 9633 pounds of indigo, 1250 buſhels of Indian corn, which, together with deer and beaver ſkins, naval ſtores, proviſions, timber, &c. amounted to no more than 27,021l. ſterling. Ten years afterwards, in 1773, they amounted to 121,677l. ſterling. The chief articles of export from this ſtate are, rice, tobacco, indigo, ſago, lumber of various kinds, naval ſtores, leather, deer ſkins, ſnake-root, myrtle, bees wax, corn, live ſtock, &c.

During the American war, Georgia was overrun by the Britiſh troops, and the inhabitants were obliged to flee to the neighbouring ſtates for ſafety. Since the peace the progreſs of the population of this ſtate is ſaid to have been aſtoniſhingly rapid; though it has been a good deal checked within theſe few years by the hoſtile irruptions of the Creek Indians, who continually haraſs the frontiers of the ſtate. Treaties have been held, and a ceſſation of hoſtilities agreed to, between the parties, but all have hitherto proved ineffectual to the accompliſhment of a peace.

Theſe Indians inhabit the middle parts of the ſtate, and

Georgia. and are the most numerous tribe of Indians of any within the limits of the United States. Their whole number is 17,280, of which 5860 are fighting men. Their principal towns lie in latitude 32° and longitude 11° 20′ from Philadelphia. They are settled in a hilly but not mountainous country. The soil is fruitful in a high degree, and well watered, abounding in creeks and rivulets, whence they are called the *Creek Indians*. The Seminolas, a division of the Creek nation, inhabit a level flat country on the Apalachicola and Flint rivers, fertile and well watered. The Chactaws or Flatheads inhabit a very fine and extensive tract of hilly country, with large and fertile plains intervening, between the Alabama and Mississippi rivers, in the western part of this state. This nation have 43 towns and villages, in three divisions, containing 12,123 souls, of which 4041 are fighting men. The Chicasaws are settled on the head branches of the Tombeckbe, Mobile, and Yazoo rivers, in the north-west corner of the state. Their country is an extensive plain, tolerably well watered from springs, and of a pretty good soil. They have 7 towns, the central one of which is in latitude 34° 23′, and longitude 14° 30′ west. The number of souls in this nation, have been reckoned at 1725, of which 575 are fighting men.

That part of Georgia which has been laid out in counties is divided into the following, viz. Chatham, Effingham, Burke, Richmond, Wilkes, Liberty, Glynn, Camden, Washington, Greene, Franklin; and the chief towns are, Savannah, Ebenezer, Waynesborough and Louisville, Augusta, Washington, Sunbury, Brunswick, St Patrick's, Golphinton, Greensburg.—Savannah was formerly the capital, and is still the largest town (see SAVANNAH). But the present seat of government in this state is *Augusta*, situated on the south-west bank of Savannah river, about 134 miles from the sea, and 117 north-west of Savannah. The town, which contains not far from 200 houses, is on a fine large plain; and as it enjoys the best soil, and the advantage of a central situation between the upper and lower countries, is rising fast into importance. Louisville, however, is designed as the future seat of government in this state. It has lately been laid out on the bank of Ogeechee river, about 70 miles from its mouth, but is not yet built.

Savannah river forms a part of the divisional line which separates this state from South Carolina. It is formed principally of two branches, by the names of *Tugulo* and *Keowee*, which spring from the mountains. Ogeechee river, about 18 miles south of the Savannah is a small river, and nearly parallel with it in its course. Alatamaha, about 60 miles south of Savannah river, is formed by the junction of the Okonee and Okemulgee branches. It is a noble river, but of difficult entrance. Like the Nile, it discharges itself by several mouths into the sea. Besides these, there is Turtle river, Little Sitilla, Great Sitilla, Crooked river, and St Mary's, which form a part of the southern boundary of the United States. The rivers in the middle and western parts of this state are the Apalachicola, which is formed by the Catahouchee and Flint rivers, Mobile, Pascagoula, and Pearl rivers. All these running southwardly, empty into the gulf of Mexico.

In the grand convention at Philadelphia in 1787, Georgia. the inhabitants of this state were reckoned at 90,000, including three-fifths of 20,000 negroes. But from the number of the militia, which has been ascertained with a considerable degree of accuracy, there cannot be at most more than half that number. No general character will apply to the inhabitants at large. Collected from different parts of the world, as interest, necessity, or inclination led them, their character and manners must of course partake of all the varieties which distinguish the several states and kingdoms from whence they came. There is so little uniformity, that it is difficult to trace any governing principles among them. An aversion to labour is too predominant, owing in part to the relaxing heat of the climate, and partly to the want of necessity to excite industry. An open and friendly hospitality, particularly to strangers, is an ornamental characteristic of a great part of this people.

In regard to religion, politics, and literature, this state is yet in its infancy. In Savannah is an Episcopal church, a Presbyterian church, a synagogue, and a German Lutheran church, supplied occasionally by a German minister from Ebenezer, where there is a large convenient stone church, and a settlement of sober and industrious Germans of the Lutheran religion. In Augusta they have an Episcopal church. In Midway is a society of Christians established on the congregational plan. Their ancestors emigrated in a colony from Dorchester, near Boston, about the year 1700, and settled at a place named Dorchester, about 20 miles south-west of Charlestown, South Carolina. In 1752, for the sake of a better climate and more land, almost the whole society removed and settled at Midway.—They, as a people, retain in a great measure that simplicity of manners, that unaffected piety and brotherly love, which characterized their ancestors, the first settlers of New England. The upper countries are supplied pretty generally by Baptist and Methodist ministers; but the greater part of the state is without ministers of any denomination.

The numerous defects in the late constitution of this state, induced the citizens pretty universally to petition for a revision of it. It was accordingly revised, or rather a new one was formed, in the course of the year 1789, nearly upon the plan of the constitution of the United States, which has lately been adopted by the state.

The charter containing the present system of education in this state was passed in the year 1785. A college, with ample and liberal endowments, is instituted in Louisville, a high and healthy part of the country, near the centre of the state. There is also provision made for the institution of an academy in each county in the state, to be supported from the same funds, and considered as parts and members of the same institution, under the general superintendance and direction of a president and board of trustees, appointed for their literary accomplishments from the different parts of the state, and invested with the customary powers of corporations. The institution thus composed is denominated *the university of Georgia*.—The funds for the support of this institution are principally in lands, amounting in the whole to about 50,000 acres, a great part of which is of the best quality,

Georgia || Gerarde.

lity, and at preſent very valuable. There are alſo nearly 6000l. ſterling in bonds, houſes, and town lots in the town of Auguſta. Other public property to the amount of 1000l. in each county has been ſet apart for the purpoſes of building and furniſhing their reſpective academies. The funds originally deſigned for the ſupport of the orphan houſe are chiefly in rice plantations and negroes.

GEORGIA, a townſhip in the county of Franklin, containing about 400 inhabitants. It is ſituated on Lake Champlain, oppoſite to the north end of South Hero iſland.

GEORGIA, a cluſter of barren iſlands in the South ſea, to the eaſtward of the coaſt of Terra del Fuego, in lat. 54° 30′ S. and long. 37° W. One of theſe iſlands is 90 miles in length, and 30 in breadth.

GEORGIC, a poetical compoſition upon the ſubject of huſbandry, containing rules therein, put into a pleaſing dreſs, and ſet off with all the beauties and embelliſhments of poetry. The word is borrowed from the Latin *georgicus*, and that of the Greek γεωργικος, of γη, *terra*, "earth," and εργαζομαι, *opero*, "I work, or labour," of εργον, *opus*, "work." Heſiod and Virgil are the two greateſt maſters in this kind of poetry.—The moderns have produced nothing in this kind, except Rapin's book of Gardening; and the celebrated poem entitled Cyder, by Mr Philips, who, if he had enjoyed the advantage of Virgil's language, would have been ſecond to Virgil in a much nearer degree.

GEORGIUM Sidus. See ASTRONOMY *Index*.

GEPIDÆ, GEPIDES, or GEPIDI, in *Ancient Geography*, according to Procopius, were a Gothic people, or a canton or branch of them; ſome of whom, in the migration of the Goths, ſettled in an iſland at the mouth of the Viſtula, which they called *Gepidos* after their own name, which denotes lazy or ſlothful; others in Dacia, calling their ſettlement there *Gepidia*.

GERANIUM, CRANE'S BILL, in *Botany*, a genus of plants belonging to the monadelphia claſs; and in the natural method ranking under the 14th order, *Gruinales*. See BOTANY *Index*.

GERAR, or GERARA, in *Ancient Geography*, the ſouth boundary of Canaan near Berſeba; ſituated between Cades and Sur; two deſerts well known, the former facing Egypt, the latter Arabia Petræa.

GERARDE, JOHN, a ſurgeon in London, and the greateſt botaniſt of his time, was many years chief gardener to Lord Burleigh; who was himſelf a great lover of plants, and had the beſt collection of any nobleman in the kingdom, among which were a great number of exotics introduced by Gerarde. In 1597 he publiſhed his *Herbal*, which was printed at the expence of J. Norton, who procured from Francfort the ſame blocks in wood as were uſed in the herbal of Tabernæmontanus. In 1663, Thomas Johnſon, an apothecary, publiſhed an improved edition of Gerarde's book; which met with ſuch approbation by the univerſity of Oxford, that they conferred on him the degree of doctor of phyſic. The deſcriptions in the herbal are plain and familiar; and both theſe authors have laboured more to make their readers underſtand the characters of the plants, than to inform them that they themſelves underſtood Greek and Latin. The herbal of Gerarde is now to be conſidered only as a literary curioſity. The figures in general expreſs very accurately the characters of the plants they are intended to repreſent.

Gerarde || Germany.

GERARDIA, a genus of plants belonging to the didynamia claſs, and in the natural method ranking under the 40th order, *Perſonatæ*. See BOTANY *Index*.

GERFALCON. See FALCO, ORNITHOLOGY *Index*.

GERGESA, in *Ancient Geography*, a Transjordan town, no otherwiſe known than by the *Gergeſeni* of St Matthew, and *Gergeſæi* of Moſes; ſuppoſed to have ſtood in the neighbourhood of Gadara and near the ſea of Tiberias. The *Gergeſæi*, one of the ſeven ancient people of Canaan, leſs frequently mentioned than the reſt, appear to have been leſs conſiderable and more obſcure: their name is from *Girgaſi*, one of Canaan's ſons. See GIRGASHITES.

GERIZIM. See GARIZIM.

GERM, in vegetation. See GERMEN.

GERMAN, in matters of genealogy, ſignifies whole, entire, or own. *Germani, quaſi eadem ſtirpe geniti*; (Feſt.). Hence,

Brother GERMAN, denotes a brother both by the father's and mother's ſide, in contradiſtinction to uterine brothers, &c. who are only ſo by the mother's ſide.

Couſins GERMAN, are thoſe in the firſt or neareſt degree, being the children of brothers or ſiſters.

Among the Romans we have no inſtance of marriage between couſins german before the time of the emperor Claudius, when they were very frequent.

Theodoſius prohibited them under very ſevere penalties, even fine and proſcription. See CONSANGUINITY.

GERMAN, or *Germanic*, alſo denotes any thing belonging to Germany; as the German empire, German flute, &c.

GERMANDER. See TEUCRIUM, BOTANY *Index*.

GERMANICUS CÆSAR, the ſon of Druſus, and paternal nephew to the emperor Tiberius, who adopted him; a renowned general, but ſtill more illuſtrious for his virtues. He took the title of *Germanicus* from his conqueſts in that country; and though he had the moderation to refuſe the empire offered to him by his army, Tiberius, jealous of his ſucceſs, and of the univerſal eſteem he acquired, cauſed him to be poiſoned, A. D. 29, aged 34. He was a protector of learning; and compoſed ſome Greek comedies and Latin poems, ſome of which are ſtill extant.

GERMANTOWN, in the county of Philadelphia, Pennſylvania, in North America, about ſeven miles from the city of Philadelphia. It was once eſteemed the ſecond town in the country, till many inland towns in a ſhort time roſe ſuperior to it, both for the extent of their eſtabliſhments and number of inhabitants. The knitting of cotton, thread, and worſted ſtockings, is carried on in it to a conſiderable extent. The principal congregation of the people called Mennoniſts is in Germantown, who derive their name from one Menno Simon, a learned man of Witmars in Germany. Although inimical to the doctrine of general ſalvation, they will not ſwear, fight, bear any civil office, go to law, or take intereſt for money. Germantown is alſo memorable for a bloody battle which was fought in it on the 4th of October, 1777.

GERMANY, a very extenſive empire of Europe, but which, in different ages of the world, has had

Germany. very different limits. Its name, according to the moſt probable conjecture, is derived from the Celtic words *Ghar man*, ſignifying a warlike man, to which their other name, *Allman*, or *Aleman*, likewiſe alludes.

The ancient hiſtory of the Germans is altogether wrapped up in obſcurity; nor do we, for many ages, know any thing more of them than what may be learned from the hiſtory of their wars with the Romans. The firſt time we find them mentioned by the Roman hiſtorians, is about the year 211 B. C. at which time Marcellus ſubdued Inſubria and Liguria, and defeated the Gæſatæ, a German nation ſituated on the banks of the Rhine. From this time hiſtory is ſilent with regard to any of theſe northern nations, till the irruption of the Cimbri and Teutones, who inhabited the moſt northerly parts of Germany. The event of their enterpriſe is related under the articles AMBRONES, CIMBRI, and TEUTONES. We muſt not, however, imagine, becauſe theſe people happened to invade Italy at the ſame time, that therefore their countries were contiguous to one another. The Cimbri and Teutones only dwelt beyond the Rhine; while the Ambrones inhabited the country between Switzerland and Provence. It is indeed very difficult to fix the limits of the country called *Germany* by the Romans. The ſouthern Germans were intermixed with the Gauls, and the northern ones with the Scythians; and thus the ancient hiſtory of the Germans includes that of the Dacians, Huns, Goths, &c. till the deſtruction of the weſtern Roman empire by them. Ancient Germany, therefore, we may reckon to have included the northern part of France, the Netherlands, Holland, *Germany* ſo called at preſent, Denmark, Pruſſia, Poland, Hungary, part of Turkey in Europe, and Muſcovy.

1 Limits of ancient Germany.

The Romans divided Germany into two regions; Belgic or Lower Germany, which lay to the ſouthward of the Rhine; and Germany Proper, or High Germany. The firſt lay between the rivers Seine and the Rhine; and in this we find a number of different nations, the moſt remarkable of which were the following.

2 Nations inhabiting Lower Germany.

1. The Ubii, whoſe territory lay between the Rhine and the Moſa or Maeſe, and whoſe capital was the city of Cologne. 2. Next to them were the Tungri, ſuppoſed to be the ſame whom Cæſar calls *Eburones* and *Condruſi*; and whoſe metropolis, then called *Attuatica*, has ſince been named *Tongres*. 3. Higher up from them, and on the other ſide of the Moſelle, were the Treviri, whoſe capital was Auguſta Trevirorum, now *Triers*. 4. Next to them were the Tribocci, Nemetes, and Vangiones. The former dwelt in Alſace, and had Argentoratum, now *Straſburg*, for their capital; the others inhabited the cities of Worms, Spire, and Mentz. 5. The Mediomatrici were ſituated along the Moſelle, about the city of Metz in Lorrain: and above them were ſituated another German nation, named *Raurici*, *Rauraci*, or *Rauriaci*, and who inabited that part of Helvetia, or Switzerland, about Baſil. To the weſtward and ſouthward of theſe were the Nervii, Sueſſiones, Silvanectes, Leuci, Rhemi, Lingones, &c. who inhabited Belgic Gaul.

Between the heads of the Rhine and Danube was ſeated the ancient kingdom of Vindelicia, whoſe capital was called *Auguſta Vindelicorum*, now *Augsburg*. Below it on the banks of the Danube were the kingdoms of Noricum and Pannonia. The firſt of theſe was divided into Noricum *Ripenſe* and *Mediterraneum*. It contained a great part of the provinces of Auſtria, Stiria, Carinthia, Tyrol, Bavaria, and ſome others of leſs note. The latter contained the kingdom of Hungary, divided into Upper and Lower; and extended from Illyricum to the Danube, and the mountains Cætii in the neighbourhood of *Vindebona*, now *Vienna*. Germany.

Upper or High Germany lay beyond the Rhine and the Danube. Between the Rhine and the Elbe were the following nations. 1. The Chauci, Upper and Lower; who were divided from each other by the river Viſurges, now the *Weſer*. Their country contained what is now called *Bremen*, *Lunenburg*, *Friezland*, and *Groninghen*. The Upper Chauci had the Cheruſci, and the lower the Chamavi on the ſouth-eaſt, and the German ocean on the north-weſt. 2. The Friſii, Upper and Lower, were divided from the Lower Chauci by the river Amiſia, now the Ems; and from one another by an arm of the Rhine. Their country ſtill retains the name of *Frieſland*, and is divided into eaſt and weſt; but the latter is now diſmembered from Germany, and become one of the Seven United Provinces. 3. Beyond the Iſela, now the *Iſel*, which bounded the country of the Friſii, were ſituated the Bructeri, who inhabited the tract now called *Broecmorland*; and the Marſi, about the river Luppe. On the other ſide of that river were the *Uſipii* or *Uſipetes*; but theſe were famed for often changing their territories, and therefore found in other places. 4. Next to theſe were the Juones, or inhabitants of Juliers, between the Maeſe and the Rhine. 5. The Catti, another ancient and warlike nation, inhabited Heſſe and Thuringia, from the Hartzian mountains to the Rhine and Weſer: among whom were comprehended the Mattiaci, whoſe capital is by ſome thought to be *Marpurg*, by others *Baden*. 6. Next to theſe were the Seduſii bordering upon Suabia; the Noriſci, or the ancient inhabitants of Northgow, whoſe capital was Nuremberg; and the Marcomanni, whoſe country anciently reached from the Rhine to the head of the Danube, and to the Neckar. The Marcomanni afterwards went and ſettled in Bohemia and Moravia, under their general or king Maroboduus: and ſome of them in Gaul, whence they drove the Boii, who had ſeated themſelves there. 7. On the other ſide of the Danube, and between the Rhine and it, were the Hermunduri, who poſſeſſed the country now called *Miſnia* in Upper Saxony; though ſome make their territories to have extended much farther, and to have reached quite to, or even beyond, the kingdom of Bohemia, once the ſeat of the Boii, whence its name. 8. Beyond them, on the north of the Danube, was another ſeat of the Marcomanni along the river Albis, or Elbe. 9. Next to Bohemia were ſituated the Quadi, whoſe territories extended from the Danube to Moravia, and the northern part of Auſtria. Theſe are comprehended under the ancient name of *Suevi*; part of whom at length forced their way into Spain, and ſettled a kingdom there. 10. Eaſtward of the Quadi were ſituated the Baſtarnæ, and parted from them by the Granna, now *Gran*; a river that falls into the Danube, and by the Carpathian mountains, from them called *Alpes Baſtarnicæ*. The country of the Baſtarnæ indeed

3 Nations inhabiting High Germany.

Germany. indeed made part of the European Sarmatia, and ſo was without the limits of Germany properly ſo called; but we find theſe people ſo often in league with the German nations, and joining them for the deſtruction of the Romans, that we cannot but account them as one people.

Between thoſe nations already taken notice of, ſeated alſo on the other ſide of the Danube and the Hercynian foreſt, were ſeveral others whoſe exact ſituation is uncertain, viz. the Martingi, Burii, Borades, Lygii or Logiones, and ſome others, who are placed by our geographers along the foreſt above mentioned, between the Danube and the Viſtula.

On this ſide the Hercynian foreſt, were the famed Rhætii, now *Griſons*, ſeated among the Alps. Their country, which was alſo called *Weſtern Illyricum*, was divided into Rhætia *Prima* or *Propria* and *Secunda*; and was then of much larger extent, ſpreading itſelf towards Suabia, Bavaria, and Auſtria.

On the other ſide of the Hercynian foreſt were, 1. The Suevi, who ſpread themſelves from the Viſtula to the river Elbe. 2. The Longobardi, ſo called according to ſome on account of their wearing long beards, but, according to others, on account of their conſiſting of two nations, viz. the Bardi and Lingones. Theſe dwelt along the river Elbe, and bordered ſouthward on the Chauci above mentioned. 3. The Burgundi, of whoſe original ſeat we are uncertain. 4. The Semnones; who, about the time of Tiberius, were ſeated on the river Elbe. 5. The Angles, Saxons, and Goths, were probably the deſcendants of the Cimbri; and inhabited the countries of Denmark, along the Baltic ſea, and the peninſula of Scandinavia, containing Norway, Sweden, Lapland, and Finmark. 6. The Vandals were a Gothic nation, who, proceeding from Scandinavia, ſettled in the countries now called *Mecklenburgh* and *Brandenburgh*. 7. Of the ſame race were the Dacians, who ſettled themſelves in the neighbourhood of the Palus Mæotis, and extended their territories along the banks of the Danube.

Theſe were the names of the German nations who performed the moſt remarkable exploits in their wars with the Romans. Beſides theſe, however, we find mention made of the Scordiſci, a Thracian nation, who afterwards ſettled on the banks of the Danube. About the year 113 B. C. they ravaged Macedon, and cut off a whole Roman army ſent againſt them; the general, M. Porcius Cato, grandſon to Cato the cenſor, being the only perſon who had the good fortune to make his eſcape. After this, they ravaged all Theſſaly; and advanced to the coaſts of the Adriatic, into which, becauſe it ſtopped their farther progreſs, they diſcharged a ſhower of darts. By another Roman general, however, they were driven back into their own country with great ſlaughter; and ſoon after, Metellus ſo weakened them by repeated defeats, that they were incapable, for ſome time, of making any more attempts on the Roman provinces. At laſt, in the conſulſhip of M. Livius Druſus and L. Calpurnius Piſo, the former prevailed on them to paſs the Danube, which thenceforth became the boundary between the Romans and them. Notwithſtanding this, in the time of the Jugurthine war, the Scordiſci repaſſed the Danube on the ice every winter, and being joined by the Triballi a people of Lower Mæſia, and the Daci of Upper Mæſia, penetrated as far as Macedon, committing everywhere dreadful ravages. So early did theſe northern nations begin to be formidable to the Romans, even when they were moſt renowned for warlike exploits.

4 Wars of the Scordiſci with the Romans.

Germany.

5 Expedition of Julius Cæſar into Germany.

Till the time of Julius Cæſar, however, we hear nothing more concerning the Germans. About 58 years B. C. he undertook his expedition into Gaul; during which, his aſſiſtance was implored by the Ædui, againſt Arioviſtus, a German prince who oppreſſed them. Cæſar, pleaſed with this opportunity of increaſing his power, invited Arioviſtus to an interview; but this being declined, he next ſent deputies, deſiring him to reſtore the hoſtages he had taken from the Ædui, and to bring no more troops over the Rhine into Gaul. To this a haughty anſwer was returned; and a battle ſoon after enſued, in which Arioviſtus was entirely defeated, and with great difficulty made his eſcape.

In 55 B. C. Cæſar having ſubdued the Sueſſiones, Bellovaci, Ambiani, Nervii, and other nations of Belgic Gaul, haſtened to oppoſe the Uſipetes and Tenchtheri. Theſe nations having been driven out of their own country by the Suevi, had croſſed the Rhine with a deſign to ſettle in Gaul. As ſoon as he appeared, the Germans ſent him a deputation, offering to join him, provided he would aſſign them lands. Cæſar replied, that there was no room in Gaul for them, but he would deſire the Ubii to give them leave to ſettle among them. Upon this, they deſired him to retreat with the Ubii; but in the mean time fell upon ſome Roman ſquadrons: which ſo provoked Cæſar, that he immediately marched againſt them, and coming unexpectedly upon them, defeated them, with great ſlaughter. They fled in the utmoſt confuſion; but the Romans purſued them to the conflux of the Rhine and the Maeſe, where the ſlaughter was renewed with ſuch fury, that almoſt 400,000 of the Germans periſhed. After this, Cæſar being reſolved to ſpread the terror of the Roman name through Germany, built a bridge over the Rhine, and entered that country. In this expedition, however, which was his laſt in Germany, he performed no remarkable exploit. A little before his death, indeed, he had projected the conqueſt of that, as well as of a great many other countries; but his aſſaſſination prevented the execution of his deſigns. Nor is there any thing recorded of the Germans till about 17 B. C. when the Tenchtheri made an irruption into Gaul, and defeated M. Lollius, proconſul of that province. At laſt, however, they were repulſed, and forced to retire with great loſs beyond the Rhine.

6 Rhætii invade Italy.

Soon after this the Rhætii invaded Italy, where they committed the greateſt devaſtations, putting all the males they met to the ſword, without diſtinction of age: nay, we are told, that when they happened to take women with child, they conſulted their augurs to know whether the child was a male or female; and if they pronounced it a male, the mother was immediately maſſacred. Againſt theſe barbarians was ſent Druſus, the ſecond ſon of Livia, a youth of extraordinary valour and great accompliſhments. He found means to bring them to a battle; in which the Romans proved victorious, and cut in pieces great numbers of their enemies, with very little loſs on their

Germany. own ſide. Thoſe who eſcaped the general ſlaughter, being joined by the Vindelici, took their route towards Gaul, with a deſign to invade that province. But Auguſtus, upon the firſt notice of their march, deſpatched againſt them Tiberius with ſeveral choſen legions. He was no leſs ſucceſsful than Druſus had been; for having tranſported his troops over the lake Brigantium, now Conſtance, he fell unexpectedly on the enemy, gave them a total overthrow, took moſt of their ſtrong holds, and obliged the whole nation to ſubmit to ſuch terms as he choſe to impoſe upon them. Thus were the Vindelici, the Rhætii, and Norici, three of the moſt barbarous nations in Germany ſubdued. Tiberius, to keep the conquered countries in awe, planted two colonies in Vindelicia, and opened from thence a road into Rhætia and Noricum. One of the cities which he built for the defence of his colonies, he called, from his father Druſus, *Druſomagus;* the other by the name of Auguſtus, *Auguſta Vindelicorum;* which cities are now known by the names of *Mimminghen* and *Augsburg*. He next encountered the Pannonians, who had been ſubdued by Agrippa, but revolted on hearing the news of that great commander's death, which happened 11 years B. C. Tiberius, however, with the aſſiſtance of their neighbours the Scordiſci, ſoon forced them to ſubmit. They delivered up their arms, gave hoſtages, and put the Romans in poſſeſſion of all their towns and ſtrong holds. Tiberius ſpared their lives; but laid waſte their fields, plundered their cities, and ſent the beſt part of their youth into other countries.

7 They are ſubdued, together with the Vindelici and Norici,

8 and the Pannonians.

In the mean time, Druſus having prevented the Gauls from revolting, which they were ready to do, prepared to oppoſe the Germans who dwelt beyond the Rhine. They had collected the moſt numerous and formidable army that had ever been ſeen in thoſe parts; with which they were advancing towards the Rhine, in order to invade Gaul. Druſus defeated them as they attempted to croſs that river; and, purſuing the advantage he had gained, entered the country of the Uſipetes, now *Relinchuſen*, and from thence advanced againſt the Sicambri in the neighbourhood of the Lyppe and Yſſel. Them he overthrew in a great battle, laid waſte their country, burnt moſt of their cities, and following the courſe of the Rhine, approached the German ocean, reducing the Friſii and the Chauci between the Ems and the Elbe. In theſe marches the troops ſuffered extremely for want of proviſions; and Druſus himſelf was often in great danger of being drowned, as the Romans who attended him were at that time quite unacquainted with the flux and reflux of the ocean.

9 Exploits of Druſus in Germany.

The Roman forces went into Eaſt Frieſland for their winter quarters; and next year (10 B. C.) Druſus marched againſt the Tenchtheri, whom he eaſily ſubdued. Afterwards, paſſing the Lupias, now the Lyppe, he reduced the Catti and Cheruſci, extending his conqueſts to the banks of the Viſurgis or Weſer; which he would have paſſed, had he not been in want of proviſions, the enemy having laid waſte the country to a conſiderable diſtance. As he was retiring, the Germans unexpectedly fell upon him in a narrow paſſage; and having ſurrounded the Roman army, cut a great many of them in pieces. But Druſus having animated his men by his example, after a bloody conflict, which laſted the whole day, the Germans were defeated with ſuch ſlaughter, that the ground was ſtrewed for ſeveral miles with dead bodies. Druſus found in their camp a great quantity of iron chains which they had brought for the Romans; and ſo great was their confidence, that they had agreed beforehand about the diviſion of the booty. The Tenchtheri were to have the horſes, the Cheruſci and Sicambri the baggage, and the Uſipetes and Catti the captives. After this victory, Druſus built two forts to keep the conquered countries in awe; the one at the confluence of the Lyppe and the Alme, the other in the country of the Catti on the Rhine. On this occaſion alſo he made a famous canal, long after called in honour of him *Foſſa Druſiana*, to convey the waters of the Rhine into the Sala or Sale. It extended eight miles; and was very convenient for conveying the Roman troops by water to the countries of the Friſii and Chauci, which was the deſign of the undertaking. Germany.

The following year (9 B. C.) Auguſtus, bent on ſubduing the whole of Germany, advanced to the banks of the Rhine, attended by his two ſons-in-law Tiberius and Druſus. The former he ſent againſt the Daci, who lived up to the ſouth of the Danube; and the latter to complete the conqueſt he had ſo ſucceſsfully begun in the weſtern parts of Germany. The former eaſily overcame the Daci, and tranſplanted 40,000 of them into Gaul. The latter, having paſſed the Rhine, ſubdued all the nations from that river to the Elbe; but having attempted in vain to croſs this laſt, he ſet out for Rome: an end, however, was put to his conqueſts and his life by a violent fever, with which he was ſeized on his return.

After the death of Druſus, Tiberius again overran all thoſe countries in which Druſus had ſpent the preceding ſummer; and ſtruck ſome of the northern nations with ſuch terror, that they ſent deputies to ſue for peace. This, however, they could not obtain upon any terms; the emperor declaring that he would not conclude a peace with one, unleſs they all deſired it. But the Catti, or according to ſome the Sicambri, could not by any means be prevailed upon to ſubmit; ſo that the war was ſtill carried on, though in a languid manner, for about 18 years. During this period, ſome of the German nations had quitted their foreſts, and begun to live in a civilized manner under the protection of the Romans; but one Quinctilius Varus being ſent to command the Roman forces in that country, ſo provoked the inhabitants by his extortions, that not only thoſe who ſtill held out refuſed to ſubmit, but even the nations that had ſubmitted were ſeized with an eager deſire of throwing off the yoke. Among them was a young nobleman of extraordinary parts and valour, named *Arminius*. He was the ſon of Sigimer, one of the moſt powerful lords among the Catti, had ſerved with great reputation in the Roman armies, and been honoured by Auguſtus with the privileges of a Roman citizen and the title of knight. But the love of his country prevailing over his gratitude, he reſolved to improve the general diſcontent which reigned among his countrymen, to deliver them from the bondage of a foreign dominion. With this view he engaged, underhand, the leading men of all the nations between the Rhine and the Elbe, in a conſpiracy againſt the Romans. In order to put Varus

10 Arminius heads the Germans againſt the Romans.

Germany. off his guard, he at the ſame time adviſed him to ſhow himſelf to the inhabitants of the more diſtant provinces, adminiſter juſtice among them, and accuſtom them, by his example, to live after the Roman manner, which he ſaid would more effectually ſubdue them than the Roman ſword. As Varus was a man of a peaceable temper, and averſe from military toils, he readily conſented to this inſidious propoſal, and, leaving the neighbourhood of the Rhine, marched into the country of the Cheruſci. Having there ſpent ſome time in hearing cauſes and deciding civil controverſies, Arminius perſuaded him to weaken his army, by ſending out detachments to clear the country of robbers. When this was done, ſome diſtant nations of Germany roſe up in arms by Arminius's directions; while thoſe through which Varus was to paſs in marching againſt them, pretended to be in a ſtate of profound tranquillity, and ready to join the Romans againſt their enemies.

11 Cuts off Varus with his army.

On the firſt news of the revolt, Varus marched againſt the enemy with three legions and ſix cohorts; but being attacked by the Germans as he paſſed through a wood, his army was almoſt totally cut off, while he himſelf and moſt of his officers fell by their own hands. Such a terrible overthrow, though it raiſed a general conſternation in Rome, did not, however, diſhearten Auguſtus, or cauſe him to abandon his enterpriſe. About two years after (A. D. 12.), Tiberius and Germanicus were appointed to command in Germany. The death of Auguſtus, however, which happened ſoon after, prevented Tiberius from going on his expedition; and Germanicus was for ſome time hindered from proceeding in his, by a revolt of the legions, firſt in Pannonia, and then in Germany. About the year 15, Germanicus having brought over the ſoldiers to their duty, laid a bridge acroſs the Rhine, over which he marched 12,000 legionaries, 26 cohorts of the allies, and eight alæ (ſquadrons of 300 each) of horſe. With theſe he firſt traverſed the Cœſian foreſt (part of the Hercynian, and thought to lie partly in the duchy of Cleves, and partly in Weſtphalia), and ſome other woods. On his march he was informed that the Marſi were celebrating a feſtival with great mirth and jollity. Upon this he advanced with ſuch expedition, that he ſurpriſed them in the midſt of their debauch; and giving his army full liberty to make what havock they pleaſed, a terrible maſſacre enſued, and the country was deſtroyed with fire and ſword for 50 miles round, without the loſs of a ſingle man on the part of the Romans.—This general maſſacre rouſed the Bructeri, the Tubantes, and the Uſipetes; who, beſetting the paſſes through which the Roman army was to return, fell upon their rear, and put them into ſome diſorder; but the Romans ſoon recovered themſelves, and defeated the Germans with conſiderable loſs.

12 Exploits of Germanicus.

The following year (A. D. 16.), Germanicus taking advantage of ſome inteſtine broils which happened among the Catti, entered their country, where he put great numbers to the ſword. Moſt of their youth, however, eſcaped by ſwimming over the Adrana, now the Oder, and attempted to prevent the Romans from laying a bridge over that river: but being diſappointed in this, ſome of them ſubmitted to Germanicus, while the greater part, abandoning their villages, took refuge in the woods; ſo that the Romans, without oppoſition, ſet fire to all their villages, towns, &c. and having laid their capital in aſhes, began their march back to the Rhine. Germany.

Germanicus had ſcarce reach his camp, when he received a meſſage from Segeſtes, a German prince, in the intereſt of the Romans, acquainting him that he was beſieged in his camp by Arminius. On this advice, he inſtantly marched againſt the beſiegers; entirely defeated them; and took a great number of priſoners, among whom was Thuſneldis, the wife of Arminius, and daughter of Segeſtes, whom the former had carried off, and married againſt her father's will. Arminius then, more enraged than ever, for the loſs of his wife, whom he tenderly loved, ſtirred up all the neighbouring nations againſt the Romans. Germanicus, however, without being diſmayed by ſuch a formidable confederacy, prepared himſelf to oppoſe the enemy with vigour: but, that he might not be obliged to engage ſuch numerous forces at once, detached his lieutenant Cæcina, at the head of 40 cohorts, into the territories of the Bructeri; while his cavalry, under the command of Pedo, entered the country of the Friſii. As for Germanicus himſelf, he embarked the remainder of his army, conſiſting of four legions, on a neighbouring lake; and tranſported them by rivers and canals to the place appointed on the river Ems, where the three bodies met. In their march they found the ſad remains of the legions conducted by Varus, which they buried with all the ceremony their circumſtances could admit. After this they advanced againſt Arminius, who retired and poſted himſelf advantageouſly cloſe to a wood. The Roman general followed him; and coming up with him, ordered his cavalry to advance and attack the enemy. Arminius, at their firſt approach, pretended to fly; but ſuddenly wheeled about, and giving the ſignal to a body of troops, whom he had concealed in the wood, to ruſh out, obliged the cavalry to give ground. The cohorts then advanced to their relief; but they too were put into diſorder, and would have been puſhed into a moraſs, had not Germanicus himſelf advanced with the reſt of the cavalry to their relief. Arminius did not think it prudent to engage theſe freſh troops, but retired in good order; upon which Germanicus alſo retired towards the Ems. Here he embarked with four legions, ordered Cæcina to reconduct the other four by land, and ſent the cavalry to the ſea ſide, with orders to march along the ſhore to the Rhine. Though Cæcina was to return by roads well known, yet Germanicus adviſed him to paſs, with all poſſible ſpeed, a cauſeway, called the *long bridges*, which led acroſs vaſt marſhes, ſurrounded on all ſides with woods and hills that gently roſe from the plain. Germany.

Arminius, however, having got notice of Cæcina's march, arrived at the long bridges before Cæcina, and filled the woods with his men, who, on the approach of the Romans, ruſhed out, and attacked them with great fury. The legions, not able to manage their arms in the deep waters and ſlippery ground, were obliged to yield; and would in all probability have been entirely defeated, had not night put an end to the combat. The Germans, encouraged by their ſucceſs, inſtead of refreſhing themſelves with ſleep, ſpent the whole night in diverting the courſes of the ſprings which

Germany. which roſe in the neighbouring mountains; ſo that, before day, the camp which the Romans had begun was laid under water, and their works were overturned. Cæcina was for ſome time at a loſs what to do; but at laſt reſolved to attack the enemy by daybreak, and, having driven them to their woods, to keep them there in a manner beſieged, till the baggage and wounded men ſhould paſs the cauſeway, and get out of the enemy's reach. But when his army was drawn up, the legions poſted on the wings, ſeized with a ſudden panic, deſerted their ſtations, and occupied a field beyond the marſhes. Cæcina thought it adviſable to follow them; but the baggage ſtuck in the mire, as he attempted to croſs the marſhes, which greatly embarraſſed the ſoldiers. Arminius perceiving this, laid hold of the opportunity to begin the attack; and crying out, "This is a ſecond Varus, the ſame fate attends him and his legions," fell on the Romans with inexpreſſible fury. As he had ordered his men to aim chiefly at the horſes, great numbers of them were killed; and the ground becoming ſlippery with their blood and the ſlime of the marſh, the reſt either fell or threw their riders, and, galloping through the ranks, put them in diſorder. Cæcina diſtinguiſhed himſelf in a very eminent manner; but his horſe being killed, he would have been taken priſoner, had not the firſt legion reſcued him. The greedineſs of the enemy, however, ſaved the Romans from utter deſtruction; for juſt as the legions were quite ſpent, and on the point of yielding, the barbarians on a ſudden abandoned them in order to ſeize their baggage. During this reſpite, the Romans ſtruggled out of the marſh, and having gained the dry fields, formed a camp with all poſſible ſpeed, and fortified it in the beſt manner they could.

The Germans having loſt the opportunity of deſtroying the Romans, contrary to the advice of Arminius, attacked their camp next morning, but were repulſed with great ſlaughter; after which they gave Cæcina no more moleſtation till he reached the banks of the Rhine. Germanicus, in the mean time, having conveyed the legions he had with him down the river Ems into the ocean, in order to return by ſea to the river Rhine, and finding that his veſſels were overloaded, delivered the ſecond and 14th legions to Publius Vitellius, deſiring him to conduct them by land. But this march proved fatal to great numbers of them; who were either buried in the quickſands, or ſwallowed up by the overflowing of the tide, to which they were as yet utter ſtrangers. Thoſe who eſcaped, loſt their arms, utenſils, and proviſions; and paſſed a melancholy night upon an eminence, which they had gained by wading up to the chin. The next morning the land returned with the tide of ebb; when Vitellius, by a haſty march, reached the river Uſingis, by ſome thought to be the Hoerenſter, on which the city of Groningen ſtands. There Germanicus, who had reached that river with his fleet, took the legions again on board, and conveyed them to the mouth of the Rhine, whence they all returned to Cologne, at a time when it was reported they were totally loſt.

This expedition, however, coſt the Romans very dear, and procured very few advantages. Great numbers of men had periſhed; and by far the greateſt part of thoſe who had eſcaped ſo many dangers returned without arms, utenſils, horſes, &c. half naked, lamed, and unfit for ſervice. The next year, however, Germanicus, bent on the entire reduction of Germany, made vaſt preparations for another expedition. Having conſidered the various accidents that had befallen him during the war, he found that the Germans were chiefly indebted for their ſafety to their woods and marſhes, their ſhort ſummers and long winters; and that his troops ſuffered more from their long and tedious marches than from the enemy. For this reaſon he reſolved to enter the country by ſea, hoping by that means to begin the campaign earlier, and ſurpriſe the enemy. Having therefore built with great deſpatch, during the winter, 1000 veſſels of different ſorts, he ordered them early in the ſpring (A. D. 16.) to fall down the Rhine, and appointed the iſland of the Batavians for the general rendezvous of his forces. When the fleet was ſailing, he detached Silius, one of his lieutenants, with orders to make a ſudden irruption into the country of the Catti; and, in the mean time, he himſelf, upon receiving intelligence that a Roman fort on the Luppias was beſieged, haſtened with ſix legions to its relief. Silius was prevented, by ſudden rains, from doing more than taking ſome ſmall booty, with the wife and daughter of Arpen, king of the Catti; neither did thoſe who beſieged the fort wait the arrival of Germanicus. In the mean time, the fleet arriving at the iſland of the Batavians, the proviſions and warlike engines were put on board and ſent forward; ſhips were aſſigned to the legions and allies; and the whole army being embarked, the fleet entered the canal formerly cut by Druſus, and from his name called *Foſſa Druſiana*. Hence he ſailed proſperouſly to the mouth of the Ems; where, having landed his troops, he marched directly to the Weſer, where he found Arminius encamped on the oppoſite bank, and determined to diſpute his paſſage. The next day Arminius drew out his troops in order of battle; but Germanicus, not thinking it adviſable to attack them, ordered the horſe to ford over under the command of his lieutenants Stertinius and Emilius; who, to divide the enemy's forces, croſſed the river in two different places. At the ſame time Cariovalda, the leader of the Batavian auxiliaries, croſſed the river where it is moſt rapid; but being drawn into an ambuſcade, he was killed, together with moſt of the Batavian nobility; and the reſt would have been totally cut off, had not Stertinius and Emilius haſtened to their aſſiſtance. Germanicus in the mean time paſſed the river without moleſtation. A battle ſoon after enſued, in which the Germans were defeated with ſo great a ſlaughter that the ground was covered with arms and dead bodies for more than 10 miles round; and among the ſpoils taken on this occaſion, were found, as formerly, the chains with which the Germans had hoped to bind their captives.

Germany. 13 His ſecond expedition.

In memory of this ſignal victory Germanicus raiſed a mount, upon which he placed as trophies the arms of the enemy, and inſcribed underneath the names of the conquered nations. This ſo provoked the Germans, though already vanquiſhed and determined to abandon their country, that they attacked the Roman army unexpectedly on its march, and put them into ſome diſorder. Being repulſed, they encamped between a river and a large foreſt ſurrounded by a marſh except

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Germany. on one ſide, where it was encloſed by a broad rampart formerly raiſed by the Angrivarii as a barrier between them and the Cheruſci. Here another battle enſued; in which the Germans behaved with great bravery, but in the end were defeated with great ſlaughter.

After this ſecond defeat, the Angrivarii ſubmitted, and were taken under the protection of the Romans, and Germanicus put an end to the campaign. Some of the legions he ſent to their winter quarters by land,

14 His fleet diſperſed by a ſtorm. while he himſelf embarked with the reſt on the river Ems, in order to return by ſea. The ocean proved at firſt very calm, and the wind favourable: but all of a ſudden a ſtorm ariſing, the fleet conſiſting of 1000 veſſels, was diſperſed: ſome of them were ſwallowed up by the waves; others were daſhed in pieces againſt the rocks, or driven upon remote and inhoſpitable iſlands, where the men either periſhed by famine, or lived upon the fleſh of the dead horſes with which the ſhores ſoon appeared ſtrewed; for, in order to lighten their veſſels, and diſengage them from the ſhoals, they had been obliged to throw overboard their horſes and beaſts of burden, nay, even their arms and baggage. Moſt of the men, however, were ſaved, and even great part of the fleet recovered. Some of them were driven upon the coaſt of Britain; but the petty kings who reigned there generouſly ſent them back.

On the news of this misfortune, the Catti, taking new courage, ran to arms; but Caius Silius being detached againſt them with 30,000 foot and 3000 horſe, kept them in awe. Germanicus himſelf, at the head of a numerous body, made a ſudden irruption into the territories of the Marſi, where he recovered one of Varus's eagles, and having laid waſte the country, he returned to the frontiers of Germany, and put his troops into winter quarters: whence he was ſoon recalled by Tiberius, and never ſuffered to return into Germany again.

After the departure of Germanicus, the more northern nations of Germany were no more moleſted by the Romans. Arminius carried on a long and ſucceſsful war with Maroboduus king of the Marcomanni, whom he at laſt expelled, and forced to apply to the Romans for aſſiſtance; but, excepting Germanicus, it ſeems they had at this time no other general capable of oppoſing Arminius, ſo that Maroboduus was never

15 Death of Arminius. reſtored. After the final departure of the Romans, however, Arminius having attempted to enſlave his country, fell by the treachery of his own kindred. The Germans held his memory in great veneration; and Tacitus informs us, that in his time they ſtill celebrated him in their ſongs.

Nothing remarkable occurs in the hiſtory of Germany from this time till the reign of the emperor Claudius. A war indeed is ſaid to have been carried on by Lucius Domitius, father to the emperor Nero. But of his exploits we know nothing more than that he penetrated beyond the river Elbe, and led his army farther into the country than any of the Romans had ever done. In the reign of Claudius, however, the German territories were invaded by Cn. Domitius Corbulo, one of the greateſt generals of his age. But when he was on the point of forcing them to ſubmit to the Roman yoke, he was recalled by Claudius, who was jealous of the reputation he had acquired.

In the reign of Veſpaſian, a terrible revolt happened among the Batavians and thoſe German nations who had ſubmitted to the Romans; a particular account of which is given under the article ROME. The revolters were with difficulty ſubdued; but, in the reign of Domitian, the Daeians invaded the empire, and proved a more terrible enemy than any of the other German nations had been. After ſeveral defeats, the emperor was at laſt obliged to conſent to pay an annual tribute to Decebalus king of the Dacians; which continued to the time of Trajan. But that warlike prince refuſed to pay tribute; alleging, when it was demanded of him, that "he had never been conquered by Decebalus." Upon this the Daeians paſſed the Danube, and began to commit hoſtilities in the Roman territories. Trajan, glad of this opportunity to humble an enemy whom he began to fear, drew together a mighty army, and marched with the utmoſt expedition to the banks of the Danube. As Decebalus was not appriſed of his arrival, the emperor paſſed the river without oppoſition, and entering Dacia, laid waſte the country with fire and ſword. At laſt he was met by Decebalus with a numerous army. A bloody engagement enſued, in which the Dacians were defeated; though the victory coſt the Romans dear: the wounded were ſo numerous, that they wanted linen to bind up their wounds; and to ſupply the defect, the emperor generouſly devoted his own wardrobe. After the victory, he purſued Decebalus from place to place, and at laſt obliged him to conſent to a peace on the following terms: 1. That he ſhould ſurrender the territories which he had unjuſtly taken from the neighbouring nations. 2. That he ſhould deliver up his arms, his warlike engines, with the artificers who made them, and all the Roman deſerters. 3. That for the future he ſhould entertain no deſerters, nor take into his ſervice the natives of any country ſubject to Rome. 4. That he ſhould diſmantle all his fortreſſes, caſtles, and ſtrong holds. And, laſtly, That he ſhould have the ſame friends and foes with the people of Rome.

Germany. 16 The Dacians invade the Roman empire.

With theſe hard terms Decebalus was obliged to comply, though ſore againſt his will; and being introduced to Trajan, threw himſelf on the ground before him, acknowledging himſelf his vaſſal; after which the latter, having commanded him to ſend deputies to the ſenate for the ratification of the peace, returned to Rome.

This peace was of no long duration. Four years after (A. D. 105.), Decebalus, unable to live in ſervitude as he called it, began, contrary to the late treaty, to raiſe men, provide arms, entertain deſerters, fortify his caſtles, and invite the neighbouring nations to join him againſt the Romans as a common enemy. The Scythians hearkened to his ſolicitations; but the Jazyges, a neighbouring nation, refuſing to bear arms againſt Rome, Decebalus invaded their country. Hereupon Trajan marched againſt him; but the Dacian, finding himſelf unable to withſtand him by open force, had recourſe to treachery, and attempted to get the emperor murdered. His deſign, however, proved abortive, and Trajan purſued his march into Dacia. That his troops might the more readily paſs and repaſs the Danube, he built a bridge over that river; which by the aneients is ſtyled the moſt magnificent and wonderful of all his works *. To guard the bridge, he

* See *Architecture*, N° 133.

Germany. he ordered two caſtles to be built; one on this ſide the Danube, and the other on the oppoſite ſide; and all this was accompliſhed in the ſpace of one ſummer. Trajan, however, as the ſeaſon was now far advanced, did not think it adviſeable to enter Dacia this year, but contented himſelf with making the neceſſary preparations.

17 They are ſubdued by Trajan.

In the year 106, early in the ſpring, Trajan ſet out for Dacia; and having paſſed the Danube on the bridge he had built, reduced the whole country, and would have taken Decebalus himſelf, had he not put an end to his own life, in order to avoid falling into the hands of his enemies. After his death the kingdom of Dacia was reduced to a Roman province; and ſeveral caſtles were built in it, and garriſons placed in them, to keep the country in awe.

After the death of Trajan, the Roman empire began to decline, and the northern nations to be daily more and more formidable. The province of Dacia indeed was held by the Romans till the reign of Gallienus; but Adrian, who ſucceeded Trajan, cauſed the arches of the bridge over the Danube to be broken down, leſt the barbarians ſhould make themſelves maſters of it, and invade the Roman territories. In the

18 Marcomanni and Quadi formidable to the empire.

time of Marcus Aurelius, the Marcomanni and Quadi invaded the empire, and gave the emperor a terrible overthrow. He continued the war, however, with better ſucceſs afterwards, and invaded their country in his turn. It was during the courſe of this war that the Roman army is ſaid to have been ſaved from deſtruction by that miraculous event related under the article CHRISTIANS, p. 70. col. 2.

In the end, the Marcomanni and Quadi were, by repeated defeats, brought to the verge of deſtruction, inſomuch that their country would probably have been reduced to a Roman province, had not Marcus Aurelius been diverted from purſuing his conqueſts by the revolt of one of his generals. After the death of Marcus Aurelius, the Germanic nations became every day more and more formidable to the Romans. Far from being able to invade and attempt the conqueſt of theſe northern countries, the Romans had the greateſt difficulty to repreſs the incurſions of their inhabitants. But for a particular account of their various invaſions of the Roman empire, and its total deſtruction by them at laſt, ſee the article ROME.

19 Roman empire deſtroyed by the Heruli.

The immediate deſtroyers of the Roman empire were the Heruli; who, under their leader Odoacer, dethroned Auguſtulus the laſt Roman emperor, and proclaimed Odoacer king of Italy. The Heruli were ſoon expelled by the Oſtrogoths; and theſe in their turn were ſubdued by Juſtinian, who annexed Italy to the eaſtern empire. But the popes found means to obtain the temporal as well as ſpiritual juriſdiction over a conſiderable part of the country, while the Lombards ſubdued the reſt. Theſe laſt proved very troubleſome to the popes, and at length beſieged Adrian I. in his capital. In this diſtreſs he applied to Charles the Great, king of France; who conquered both Italy and Germany, and was crowned emperor of the weſt in 800.

20 Hiſtory of Germany ſince the time of Charlemagne.

The poſterity of Charlemagne inherited the empire of Germany until the year 880; at which time the different princes aſſumed their original independence, rejected the Carlovingian line, and placed Arnulph king of Bohemia on the throne. Since this time Germany has ever been conſidered as an elective monarchy. Princes of different families, according to the prevalence of their intereſt and arms, have mounted the throne. Of theſe the moſt conſiderable, until the Auſtrian line acquired the imperial power were the houſes of Saxony, Franconia, and Suabia. The reigns of theſe emperors contain nothing more remarkable than the conteſts between them and the popes; for an account of which ſee the article ITALY. From hence, in the beginning of the 13th century, aroſe the factions of the Guelphs and Gibellines, of which the former was attached to the popes, and the latter to the emperor; and both, by their virulence and inveteracy, tended to diſquiet the empire for ſeveral ages. The emperors too were often at war with the infidels; and ſometimes, as happens in all elective kingdoms, with one another, about the ſucceſſion. Germany.

But what more deſerves our attention is the progreſs of government in Germany, which was in ſome meaſure oppoſite to that of the other kingdoms of Europe. When the empire raiſed by Charlemagne fell aſunder, all the different independent princes aſſumed the right of election; and thoſe now diſtinguiſhed by the name of *electors* had no peculiar or legal influence in appointing a ſucceſſor to the imperial throne; they were only the officers of the king's houſehold, his ſecretary, his ſteward, chaplain, marſhal, or maſter of his horſe, &c. By degrees, however, as they lived near the king's perſon, and had, like all other princes, independent territories belonging to them, they increaſed their influence and authority; and in the reign of Otho III. 984, acquired the ſole right of electing the emperor. Thus, while in the other kingdoms of Europe, the dignity of the great lords, who were all originally allodial or independent barons, was diminiſhed by the power of the king, as in France, and by the influence of the people as in Great Britain; in Germany, on the other hand the power of the electors was raiſed upon the ruins of the emperor's ſupremacy, and of the people's juriſdiction. In 1440, Frederic III. duke of Auſtria was elected emperor, and the imperial dignity continued in the male line of that family for 300 years. His ſucceſſor Maximilian married the heireſs of Charles duke of Burgundy; whereby Burgundy and the 17 provinces of the Netherlands were annexed to the houſe of Auſtria. Charles V. grandſon of Maximilian, and heir to the kingdom of Spain, was elected emperor in the year 1519. Under him MEXICO and PERU were conquered by the Spaniards; and in his reign happened the REFORMATION in ſeveral parts of Germany; which, however, was not, confirmed by public authority till the year 1648, by the treaty of Weſtphalia, and in the reign of Ferdinand III. The reign of Charles V. was continually diſturbed by his wars with the German princes and the French king Francis I. Though ſucceſsful in the beginning of his reign, his good fortune towards the concluſion of it began to forſake him; which, with other reaſons, occaſioned his abdication of the crown. See CHARLES V.

His brother Ferdinand I. who in 1558 ſucceeded to the throne, proved a moderate prince with regard to religion. He had the addreſs to get his ſon Maximilian declared king of the Romans in his own life-

time,

Germany. time, and died in 1564. By his laſt will he ordered, that if either his own male iſſue, or that of his brother Charles, ſhould fail, his Auſtrian eſtates ſhould revert to his ſecond daughter Anne, wife to the elector of Bavaria, and her iſſue. We mention this deſtination, as it gave riſe to the late oppoſition made by the houſe of Bavaria to the pragmatic ſanction, in favour of the empreſs queen of Hungary, on the death of her father Charles VI. The reign of Maximilian II. was diſturbed with internal commotions, and an invaſion from the Turks: but he died in peace in 1576. He was ſucceeded by his ſon Rodolph; who was involved in wars with the Hungarians, and in differences with his brother Matthias, to whom he ceded Hungary and Auſtria in his lifetime. He was ſucceeded in the empire by Matthias; under whom the reformers, who went under the names of *Lutherans* and *Calviniſts*, were ſo much divided among themſelves, as to threaten the empire with a civil war. The ambition of Matthias at laſt tended to reconcile them; but the Bohemians revolted, and threw the imperial commiſſaries out of a window at Prague. This gave riſe to a ruinous war, which laſted 30 years. Matthias thought to have exterminated both parties; but they formed a confederacy, called the *Evangelic League*, which was counterbalanced by a Catholic league.

Matthias dying in 1618, was ſucceeded by his couſin Ferdinand II.; but the Bohemians offered their crown to Frederic the elector Palatine, the moſt powerful Proteſtant prince in Germany, and ſon-in-law to his Britannic majeſty James I. That prince was incautious enough to accept of the crown: but he loſt it, by being entirely defeated by the duke of Bavaria and the imperial generals at the battle of Prague; and he was even deprived of his electorate, the beſt part of which was given to the duke of Bavaria. The Proteſtant princes of Germany, however, had among them at this time many able commanders, who were at the head of armies, and continued the war with wonderful obſtinacy: among them were the margrave of Baden Durlach, Chriſtian duke of Brunſwick, and count Mansfeld; the laſt was one of the beſt generals of the age. Chriſtiern IV. king of Denmark declared for them; and Richelieu, the French miniſter, was not fond of ſeeing the houſe of Auſtria aggrandized. The emperor, on the other hand, had excellent generals; and Chriſtiern, having put himſelf at the head of the evangelic league, was defeated by Tilly, an Imperialiſt of great reputation in war. Ferdinand made ſo moderate a uſe of his advantages obtained over the Proteſtants, that they formed a freſh conſpiracy at Leipſic, of which the celebrated Guſtavus Adolphus king of Sweden was the head. An account of his glorious victories is given under the article SWEDEN. At laſt he was killed at the battle of Lutzen in 1632. But the Proteſtant cauſe did not die with him. He had brought up a ſet of heroes, ſuch as the duke of Saxe Weimer, Torſtenſon, Banier, and others, who ſhook the Auſtrian power; till under the mediation of Sweden, a general peace was concluded among all the belligerent powers, at Munſter, in the year 1648: which forms the baſis of the preſent political ſyſtem of Europe.

Ferdinand II. was ſucceeded by his ſon Ferdinand III. This prince died in 1657; and was ſucceeded by the emperor Leoppld, a ſevere, unamiable, and not very fortunate prince. He had two great powers to contend with, France on the one ſide, and the Turks on the other; and was a loſer in his war with both. Louis XIV. at that time king of France, was happy in having the two celebrated generals Condé and Turenne in his ſervice. The latter had already diſtinguiſhed himſelf by great exploits againſt the Spaniards; and, on the acceſſion of Leopold, the court of France had taken the opportunity of confirming the treaty of Munſter, and attaching to her intereſt ſeveral of the independent princes of Germany. The tranquillity which now took place, however, was not eſtabliſhed upon any permanent baſis. War with Spain was reſumed in the year 1668; and the great ſucceſſes of Turenne in the Netherlands ſtimulated the ambition of the prince of Condé to attempt the conqueſt of Franche Compté, at that time under the protection of the houſe of Auſtria. This was accompliſhed in three weeks: but the rapid ſucceſs of Louis had awakened the jealouſy of his neighbours to ſuch a degree, that a league was formed againſt him by England, Holland, and Sweden; and the French monarch, dreading to enter the liſts with ſuch formidable enemies, conſented to the treaty of Aix-la-Chapelle, by which, among other articles, Franche Compté was reſtored. The flames of war, however, were renewed by the inſatiable ambition of the French monarch; who, having entered into an alliance with Charles II. of England, aimed at nothing leſs than the total overthrow of the Dutch republic. The events of that war are related under the article UNITED PROVINCES; here it is ſufficient to obſerve, that the misfortunes of the Dutch excited the compaſſion of the emperor and court of Spain, who now openly declared themſelves their allies Turenne was oppoſed by the prince of Orange in conjunction with the celebrated Imperial general Montecuculi, whoſe artful conduct eluded even the penetration of Turenne, and he ſat down ſuddenly before the city of Bonne. Here he was joined by the prince of Orange, who had likewiſe found means to elude the vigilance of the French generals. Bonne ſurrendered in a ſhort time, and ſeveral other places in Cologne fell into the hands of the allies; who likewiſe cut off the communication betwixt France and the United Provinces; ſo that Louis was ſoon obliged to recal his armies, and abandon all his conqueſts with greater rapidity than they had been made. In 1674 he was abandoned by his ally Charles II. of England, and the biſhop of Munſter and elector of Cologne were compelled to renounce their allegiance to him; but notwithſtanding theſe misfortunes, he continued everywhere to make head againſt his enemies, and even meditated new conqueſts. With a powerful army he again invaded Franche Compté in perſon, and in ſix weeks reduced the whole province to his obedience. In Alſace, Turenne defeated the Imperial general at Sintzheim, and ravaged the palatinate. Seventy thouſand Germans were ſurpriſed; a conſiderable detachment was cut in pieces at Mulhauſen; the elector of Brandenburg, who had been intruſted with the chief command, was routed by Turenne near Colmar; a third body met with a ſimilar fate at Turkheim; and the whole German forces were obliged at laſt to evacuate the province and repaſs the Rhine.

Germany. In conſequence of theſe diſaſters the imperial general Montecuculi was recalled to act againſt Turenne. The military ſkill of the two commanders ſeemed to be nearly equal; but before the ſuperiority could be adjudged to either, Turenne was killed by a cannon ball as he was reconnoitring a ſituation for erecting a battery. By his death the Imperialiſts obtained a decided ſuperiority. Montecuculi penetrated into Alſace; and the French, under De Lorges nephew to the deceaſed general, were happy in being able to eſcape a defeat.

Part of the German army now ſat down before Treves, where they were oppoſed by Mareſchal Crequi; but the negligence of that general expoſed him to ſuch a dreadful defeat, that he was obliged to fly into the city with only four attendants. Here he endeavoured in vain to animate the people to a vigorous defence. The garriſon mutinied againſt his authority; and, when he refuſed to ſign the capitulation they made, delivered him up priſoner to the enemy. Louis in the mean time had taken the field in perſon againſt the prince of Orange; but the diſaſtrous ſtate of affairs in Germany induced him to recal the prince of Condé to make head againſt Montecuculi. In this campaign the prince ſeemed to have the advantage. He compelled the Germans to raiſe the ſieges of Hagenau and Saverne; and at laſt to repaſs the Rhine without having been able to force him to a battle.

This was the laſt campaign made by theſe celebrated commanders; both of them now, contented with the fame they had acquired, retiring from the field to ſpend the remainder of their days in peace. The excellent diſcipline, however, which the two great French generals had introduced into their armies, ſtill continued to make them very formidable, though it did not always enſure them of victory. In Germany, the duke of Lorrain, who had recovered Philipſburg, was repeatedly defeated by Mareſchal Crequi, who had been ranſomed from his captivity, and become more prudent by his defeat. In Flanders, the prince of Orange was overmatched by the duke of Orleans and Marſhal Luxemburg. A peace was at length concluded at Nimeguen in 1679, by which the king of France ſecured himſelf Franche Compté with a great many cities in the Netherlands; while the king of Sweden was reinſtated in thoſe places of which he had been ſtripped by the Danes and Germans. This tranquillity, however, was of no long duration. Louis employed every moment in preparations for new conqueſts; poſſeſſed himſelf of the imperial city of Straſburg by treachery; and diſpoſſeſſed the elector Palatine and the elector of Treves of the lordſhips of Falkemburg, Germanſheim, and Valdentz. On the moſt frivolous pretences he had demanded Aloſt from the Spaniards; and on their refuſal, ſeized upon Luxemburg. His conduct, in ſhort, was ſo intolerable, that the prince of Orange, his inveterate enemy, found means to unite the whole empire in a league againſt him. Spain and Holland became parties in the ſame cauſe; and Sweden and Denmark ſeemed alſo inclined to accede to the general confederacy. Notwithſtanding this formidable combination, however, Louis ſeemed ſtill to have the advantage. He made himſelf maſter of the cities of Philipſburg, Manheim, Frankendal, Spires, Worms, and Oppenheim: the fruitful country of the Palatinate was ravaged in a dreadful manner; the towns were reduced to aſhes; and the people, driven from their habitations, were everywhere left to periſh through the inclemency of the weather and want of proviſions. By this cruelty his enemies were rather exaſperated than vanquiſhed: the Imperialiſts, under the conduct of the duke of Lorrain, reſumed their courage, and put a ſtop to the French conqueſts. At length all parties, weary of a deſtructive war, conſented to the treaty of Ryſwick in 1697. By this treaty Louis gave up to the empire, Fribourg, Briſac, Kheil, and Philipſburg; he conſented alſo to deſtroy the fortifications of Straſburg. Fort Louis and Traerbach, the works of which had exhauſted the ſkill of the great Vauban, with Lorrain, Treves, and the Palatinate, were reſigned to their reſpective princes; inſomuch that the terms to which the French monarch now conſented, after ſo many victories, were ſuch as could ſcarce have been expected under the preſſure of the greateſt misfortunes. The views of Louis, however, in conſenting to this apparently humiliating treaty, were beyond the views of ordinary politicians. The health of the king of Spain was in ſuch a declining way, that his death appeared to be at hand; and Louis now reſolved to renew his pretenſions to that kingdom, which he had formerly by treaty ſolemnly renounced. His deſigns in this reſpect could not be concealed from the vigilance of William III. of Britain; of which Louis being ſenſible, and knowing that the emperor had claims of the ſame nature on Spain, he thought proper to enter into a very extraordinary treaty with William. This was no leſs than the partition of the whole Spaniſh dominions, which were now to be diſtributed in the following manner. To the young prince of Bavaria were to be aſſigned Spain and the Eaſt Indies; the dauphin, ſon to Louis, was to have Naples, Sicily, and the province of Guipuſcoa; while the archduke Charles, ſon to the emperor Leopold, was to have only the duchy of Milan. By this ſcandalous treaty the indignation of Charles was roufed, ſo that he bequeathed the whole of his dominions to the prince of Bavaria. This ſcheme, however, was diſconcerted by the ſudden death of the prince; upon which a new treaty of partition was concluded between Louis and William. By this the kingdom of Spain, together with the Eaſt India territories, were to be beſtowed on the archduke Charles, and the duchy of Milan upon the duke of Lorrain. The laſt moments of the Spaniſh monarch were diſturbed by the intrigues of the rival houſes of Auſtria and Bourbon; but the haughtineſs of the Auſtrian miniſters ſo diſguſted thoſe of Spain, that they prevailed upon their dying monarch to make a new will. By this the whole of his dominions were bequeathed to Philip duke of Anjou, grandſon to the king of France; and Louis, prompted by his natural ambition, accepted the kingdom bequeathed to his grandſon, excuſing himſelf to his allies in the beſt manner he could for departing from his engagements with them. For this, however, he was made to pay dear. His inſatiable ambition and his former ſucceſſes had alarmed all Europe. The emperor, the Dutch, and the king of England, entered into a new confederacy againſt him; and a bloody war enſued, which threatened

Germany. to overthrow the French monarchy entirely. While this war (of which an account is given under the article BRITAIN) was carried on with ſuch ſucceſs, the emperor Leopold died in the year 1705.

He was ſucceeded by his ſon Joſeph, who put the electors of Cologne and Bavaria to the ban of the empire; but being ill ſerved by Prince Louis of Baden general of the empire, the French partly recovered their affairs, notwithſtanding their repeated defeats. The duke of Marlborough had not all the ſucceſs he expected or deſerved. Joſeph himſelf was ſuſpected of a deſign to ſubvert the Germanic liberties; and it was plain by his conduct, that he expected England ſhould take the labouring oar in the war, which was to be entirely carried on for his benefit. The Engliſh were diſguſted at his ſlowneſs and ſelfiſhneſs: but he died in 1711, before he had reduced the Hungarians; and leaving no male iſſue, he was ſucceeded in the empire by his brother Charles VI. whom the allies were endeavouring to place on the throne of Spain, in oppoſition to Philip duke of Anjou, grandſon to Louis XIV.

When the peace of Utrecht took place in 1713, Charles at firſt made a ſhow as if he would continue the war; but found himſelf unable, now that he was forſaken by the Engliſh. He therefore was obliged to conclude a peace with France at Baden in 1714, that he might attend the progreſs of the Turks in Hungary; where they received a total defeat from Prince Eugene at the battle of Peterwaradin. They received another of equal importance from the ſame general in 1717, before Belgrade, which fell into the hands of the Imperialiſts; and next year the peace of Paſſarowitz, between them and the Turks was concluded. Charles employed every minute of his leiſure in making arrangements for increaſing and preſerving his hereditary dominions in Italy and the Mediterranean. Happily for him, the crown of Britain devolved to the houſe of Hanover; an event which gave him a very deciſive weight in Europe, by the connexions between George I. and II. and the empire. Charles was ſenſible of this; and carried matters with ſo high a hand, that, about the years 1724 and 1725, a breach enſued between him and George I. and ſo unſteady was the ſyſtem of affairs all over Europe at that time, that the capital powers often changed their old alliances, and concluded new ones contradictory to their intereſt. Without entering into particulars, it is ſufficient to obſerve, that the ſafety of Hanover, and its aggrandizement, was the main object of the Britiſh court; as that of the emperor was the eſtabliſhment of the pragmatic ſanction in favour of his daughter (the late empreſs queen), he having no male iſſue. Mutual conceſſions upon thoſe great points reſtored a good underſtanding between George II. and the emperor Charles: and the elector of Saxony, flattered with the view of gaining the throne of Poland, relinquiſhed the great claims he had upon the Auſtrian ſucceſſion.

The emperor, after this, had very bad ſucceſs in a war he entered into with the Turks, which he had undertaken chiefly to indemnify himſelf for the great ſacrifices he had made in Italy to the princes of the houſe of Bourbon. Prince Eugene was then dead, and he had no general to ſupply his place. The ſyſtem of France, however, under Cardinal Fleury, happened at that time to be pacific; and ſhe obtained for him, from the Turks, a better peace than he had reaſon to expect. Charles, to keep the German and other powers eaſy, had, before his death, given his eldeſt daughter, the late empreſs queen, in marriage to the duke of Lorrain, a prince who could bring no acceſſion of power to the Auſtrian family. Germany.

Charles died in 1740; and was no ſooner in the grave, than all he had ſo long laboured for muſt have been overthrown, had it not been for the firmneſs of George II. The young king of Pruſſia entered and conquered Sileſia, which he ſaid had been wrongfully diſmembered from his family. The king of Spain and the elector of Bavaria ſet up claims directly incompatible with the pragmatic ſanction, and in this they were joined by France; though all thoſe powers had ſolemnly guaranteed it. The imperial throne, after a conſiderable vacancy, was filled up by the elector of Bavaria, who took the title of *Charles VII.* in January 1742. The French poured their armies into Bohemia, where they took Prague; and the queen of Hungary, to take off the weight of Pruſſia, was forced to cede to that prince the moſt valuable part of the duchy of Sileſia by a formal treaty.

Her youth, her beauty, and ſufferings, and the noble fortitude with which ſhe bore them, touched the hearts of the Hungarians, into whoſe arms ſhe threw herſelf and her little ſon; and though they had been always remarkable for their diſaffection to the houſe of Auſtria, they declared unanimouſly in her favour. Her generals drove the French out of Bohemia; and George II. at the head of an Engliſh and Hanoverian army, gained the battle of Dettingen, in 1743. Charles VII. was at this time miſerable on the imperial throne, and would have given the queen of Hungary almoſt her own terms; but ſhe haughtily and impolitically rejected all accommodation, though adviſed to it by his Britannic majeſty, her beſt and indeed only friend. This obſtinacy gave a colour for the king of Pruſſia to invade Bohemia, under pretence of ſupporting the imperial dignity; but though he took Prague, and ſubdued the greateſt part of the kingdom, he was not ſupported by the French; upon which he abandoned all his conqueſts, and retired into Sileſia. This event confirmed the obſtinacy of the queen of Hungary: who came to an accommodation with the emperor, that ſhe might recover Sileſia. Soon after, his Imperial majeſty, in the beginning of the year 1745, died; and the duke of Lorrain, then grand duke of Tuſcany, conſort to the queen of Hungary, after ſurmounting ſome difficulties, was choſen emperor.

The bad ſucceſs of the allies againſt the French and Bavarians in the Low Countries, and the loſs of the battle of Fontenoy, retarded the operations of the empreſs queen againſt his Pruſſian majeſty. The latter beat the emperor's brother, Prince Charles of Lorrain, who had before driven the Pruſſians out of Bohemia; and the conduct of the empreſs queen was ſuch, that his Britannic majeſty thought proper to guarantee to him the poſſeſſion of Sileſia, as ceded by treaty. Soon after, his Pruſſian majeſty pretended that he had diſcovered a ſecret convention which had been entered into between the empreſs queen, the empreſs of Ruſſia, and the king of Poland as elector of Saxony, to ſtrip him of his dominions, and to divide

Germany. them among themſelves. Upon this his Pruſſian majeſty, very ſuddenly, drove the king of Poland out of Saxony, defeated his troops, and took poſſeſſion of Dreſden; which he held till a treaty was made under the mediation of his Britannic majeſty, by which the king of Pruſſia acknowledged the duke of Lorrain, great duke of Tuſcany, for emperor. The war, however, continued in the Low Countries, not only to the diſadvantage, but to the diſcredit of the Auſtrians and Dutch, till it was finiſhed by the treaty of Aix-la-Chapelle, in April 1748. By that treaty Sileſia was once more guaranteed to the king of Pruſſia. It was not long before that monarch's jealouſies were renewed and verified; and the empreſs of Ruſſia's views falling in with thoſe of the empreſs queen and the king of Poland, who were unnaturally ſupported by France in their new ſchemes, a freſh war was kindled in the empire. The king of Pruſſia declared againſt the admiſſion of the Ruſſians into Germany, and his Britannic majeſty againſt that of the French. Upon theſe two principles all former differences between theſe monarchs were forgotten, and the Britiſh parliament agreed to pay an annual ſubſidy of 670,000l. to his Pruſſian majeſty during the continuance of the war.

The flames of war now broke out in Germany with greater fury and more deſtructive violence than ever. The armies of his Pruſſian majeſty, like an irreſiſtible torrent, burſt into Saxony; totally defeated the imperial general Brown at the battle of Lowoſitz; forced the Saxons to lay down their arms, though almoſt impregnably fortified at Pirna; and the elector of Saxony fled to his regal dominions in Poland. After this, his Pruſſian majeſty was put to the ban of the empire; and the French poured, by one quarter, their armies, as the Ruſſians did by another, into the empire. The conduct of his Pruſſian majeſty on this occaſion is the moſt amazing that is to be met with in hiſtory; for a particular account of which, ſee the article PRUSSIA.

At laſt, however, the taking of Colberg by the Ruſſians, and of Schweidnitz by the Auſtrians, was on the point of completing his ruin, when his moſt formidable enemy, the empreſs of Ruſſia, died January 5. 1762; George II. his only ally, had died on the 25th of October 1760.

The deaths of thoſe illuſtrious perſonages were followed by great conſequences. The Britiſh miniſtry of George III. ſought to finiſh the war with honour, and the new emperor of Ruſſia recalled his armies. His Pruſſian majeſty was, notwithſtanding, ſo very much reduced by his loſſes, that the empreſs queen, probably, would have completed his deſtruction, had it not been for the wiſe backwardneſs of other German princes, not to annihilate the houſe of Brandenburg. At firſt the empreſs queen rejected all terms propoſed to her, and ordered 30,000 men to be added to her armies. The viſible backwardneſs of her generals to execute her orders, and new ſucceſſes obtained by his Pruſſian majeſty, at laſt prevailed on her to agree to an armiſtice, which was ſoon followed by the treaty of Hubertſburgh, which ſecured to his Pruſſian majeſty the poſſeſſion of Sileſia. Upon the death of the emperor her huſband, in 1765, her ſon Joſeph, who had been crowned king of the Romans in 1764, ſucceeded him in the empire.

This prince ſhowed an active and reſtleſs diſpo- Germany.
ſition, much inclined to extend his territories by conqueſt, and to make reformations in the internal policy of his dominions, yet without taking any proper methods for accompliſhing his purpoſes. Hence he was almoſt always diſappointed; inſomuch that he wrote for himſelf the following epitaph: "Here lies Joſeph, unfortunate in all his undertakings." In the year 1778, a war commenced betwixt him and the king of Pruſſia; in which, notwithſtanding the impetuous valour of that monarch, Joſeph acted with ſuch caution that his adverſary could gain no advantage over him; and an accommodation took place without any remarkable exploit on either ſide. In 1781 he took the opportunity of the quarrel betwixt Britain and the United Provinces, to deprive the latter of the barrier towns which had been ſecured to them by the treaty of Utrecht. Theſe indeed had frequently been of great uſe to the houſe of Auſtria in its ſtate of weakneſs; but Joſeph, conſcious of his own ſtrength, looked upon it as derogatory to his honour to allow ſo many of his cities to remain in the hands of foreigners, and to be garriſoned at his expence. As at that time the Dutch were unable to reſiſt, the imperial orders for evacuating the barrier towns were inſtantly complied with; nor did the court of France, though then in friendſhip with Holland, make any offer to interpoſe. Encouraged by this ſucceſs, Joſeph next demanded the free navigation of the Scheldt; but as this would evidently have been very detrimental to the commercial intereſts of Holland, a flat refuſal was given to his requiſitions. In this the emperor was much diſappointed; having flattered himſelf that the Hollanders, intimidated by his power, would yield the navigation of the river as eaſily as they had done the barrier. Great preparations were made by the emperor, which the Dutch, on their part, ſeemed determined to reſiſt. But while the emperor appeared ſo much ſet upon this acquiſition, he ſuddenly abandoned the project entirely, and entered into a new ſcheme of exchanging the Netherlands for the duchy of Bavaria. This was oppoſed by the king of Pruſſia; and by the interference of the court of France, the emperor found himſelf at laſt obliged alſo to abandon his other ſcheme of obtaining the navigation of the Scheldt. A treaty of peace was concluded, under the guarantee of his moſt Chriſtian majeſty. The principal articles were, that the ſtates acknowledged the emperor's ſovereignty over the Scheldt from Antwerp to the limits of Seſtingen; they agreed to demoliſh certain forts, and to pay a conſiderable ſum of money in lieu of ſome claims which the emperor had on Maeſtricht, and by way of indemnification for laying part of his territories under water.

The treaty with the Dutch was no ſooner concluded than a quarrel with the Turks took place, which terminated in an open war. It does not appear that the emperor had at this time any real provocation, but ſeems to have acted merely in conſequence of his engagements with Ruſſia to reduce the dominions of the Grand Signior. All theſe foreign engagements, however, did not in the leaſt retard the progreſs of reformation which the emperor carried on throughout his dominions with a rapidity ſcarcely to be matched, and which at laſt produced the revolt of the Auſtrian Netherlands. In the courſe of his labours in this way, a

Germany. complete code of laws was compiled. Theſe were at firſt greatly commended for their humanity, as excluding almoſt entirely every ſpecies of capital puniſhment; yet, when narrowly conſidered, the commutations were found to be ſo exceedingly ſevere, that the moſt cruel death would, comparatively ſpeaking, have been an act of mercy. Even for ſmaller crimes the puniſhments were ſevere beyond meaſure; but the greateſt fault of all was, that the modes of trial were very defective, and the puniſhments ſo arbitrary, that the moſt perfect and innocent character lay at the mercy of a tyrannical judge. The innovations in eccleſiaſtical matters were, however, moſt offenſive to his ſubjects in the Netherlands. Among the many changes introduced into this department, the following were ſome of the moſt remarkable. 1. An abridgment of divine ſervice. 2. A total ſuppreſſion of vocal performers in choirs. 3. The introduction of the vernacular language inſtead of the Latin in adminiſtering the ſacraments. 4. The prohibition of chanting hymns in private houſes. 5. The ſuppreſſion of a great number of religious houſes, and the reduction of the number of the clergy. 6. The total abolition of the papal ſupremacy throughout the imperial dominions. The ſame ſpirit of innovation diſplayed itſelf even in the moſt minute matters. Many favours were beſtowed upon the Jews; and in 1786 the emperor wrote with his own hand to the different handicraft and trading corporations in Vienna, requeſting that their youths might be received as apprentices in that city. Severe laws againſt gaming were enacted and put in execution with equal rigour. Heavy reſtrictions were alſo laid on all the ſocieties of free maſons in Germany, while thoſe in the Netherlands were totally ſuppreſſed.

The great number of innovations in religious matters were highly reſented by the inhabitants of the Netherlands, who have always been remarkable for their attachment to the Romiſh religion in its moſt ſuperſtitious form. Indeed the alterations in the civil conſtitution were ſo great, that even thoſe who were leaſt bigotted in this reſpect began to fear that their liberties were in danger, and an univerſal diſſatisfaction was excited. The emperor behaved at firſt in a very haughty manner, and refuſed to yield the ſmalleſt point to the ſolicitations of his ſubjects. Finding, however, that a general revolt was about to take place, and being unable at that time, on account of the Turkiſh war, to ſpare ſuch a force as would be neceſſary to reduce the provinces to obedience, he thought proper, in the autumn of 1787, to promiſe a reſtoration of their ancient conſtitution and privileges. His promiſes, however, were found to be ſo deluſive, and his conduct was ſo arbitrary and capricious, that in the end of the year 1789 the ſtates of all the provinces in the Auſtrian Netherlands came to a reſolution of entirely throwing off the yoke. Articles of a federal union were drawn up, and a new republic was formed under the title of the *Belgic Provinces*. The ſituation of the emperor's affairs at that time did not allow him to take the meaſures neceſſary for preventing this revolt; to which perhaps his ill ſtate of health alſo contributed. About the beginning of February 1790 his diſtemper increaſed to ſuch a degree as to be thought dangerous; and continuing daily to grow worſe, he ſunk under it on the 20th of the ſame month, in the 40th year of his age, and 26th of his reign. Germany.

The leaders of the Auſtrian revolution, however, ſoon became ſo diſagreeable to their countrymen, that they were obliged to fly; and the congreſs, which had been eſtabliſhed as the ſupreme legiſlative body, behaved with ſuch tyranny, that they became generally deteſted. Meantime, the late emperor was ſucceeded by his brother Peter Leopold Joſeph, grand duke of Tuſcany; under whoſe adminiſtration matters have taken a more favourable turn. By his wiſdom, moderation, and humanity, he has already in a great meaſure retrieved the bad conſequences of his predeceſſor's conduct, having made peace with the Ottomans, and regained the allegiance of the Netherlands; and upon the whole ſeems to be actuated not more by a ſenſe of his own rights, than by a regard to the rights and happineſs of his ſubjects.

At preſent, Germany is bounded on the north by the Baltic ſea, Denmark, and the German ocean; on the eaſt, by Pruſſia, Hungary, and Poland; and on the weſt, by the Low Countries, Lorrain, and Franche Compté: ſo that it now comprehends the Palatinate of Cologne, Triers, and Liege, which formerly belonged to the Gauls; and is diſmembered of Frieſland, Groningen, and Overyſſel, which are now incorporated with the Low Countries.

21 Situation, extent, &c. of Germany.

Since the time of Charles the Great, this country has been divided into High and Low Germany. The firſt comprehends the Palatinate of the Rhine, Franconia, Suabia, Bavaria, Bohemia, Moravia, Auſtria, Carinthia, Carniola, Stiria, the Swiſs, and the Griſons. The provinces of Low Germany are, the Low Country of the Rhine, Triers, Cologne, Mentz, Weſtphalia, Heſſe, Brunſwick, Miſnia, Luſatia, High Saxony upon the Elbe, Low Saxony upon the Elbe, Mecklenburg, Lunenburg, Brandenburg, and Pomerania.

22 Conſtitution of the empire.

Monarchy was firſt eſtabliſhed in Germany by Clodovick: after him Charlemagne extended his power and his dominions; and ſo great had the empire become, that during his reign, and that of his ſon, government was adminiſtered in the provinces by perſons veſted with power for that purpoſe under the title of *Dukes*. In the diſtricts of theſe provinces, juſtice was diſtributed by a *comes* or count, which officer was in Germany called *Graf*. But from their courts lay an appeal to that of the emperor, before a preſident ſtyled *Comes Palatinus*, that is, "Count Palatine, or of the palace," in German denominated *Pfalzgraf*. The frontiers or marches were governed by a marquis, ſtyled by the Germans *Markgraf*, ſimilar to our lord warden. Generally the centre of the empire was ruled by an officer who poſſeſſed a ſimilar power, but a greater extent of dominion, than the Grave, under the title of *Landgrave*. Towns and caſtles, which were occaſionally honoured with the reſidence of the emperor, were governed by a Burggraf. It may be remarked, that the ſignification of the above-mentioned titles, and the extent of power which they conferred upon the perſons honoured with them, differ according to the ſucceſſive ages and the gradual developement of the German conſtitution.

By reaſon of family broils in the imperial houſe, and civil wars in their dominions, the dignity of the ſove-

reign

Germany. reign was depreſſed, and a new form in the government raiſed up. The dukes exalted themſelves above the power of the emperor, and ſecured for their ſons a ſucceſſion to their greatneſs; while the intereſt of the ſovereign, in order to ſtrengthen the bond of perſonal attachment, ratified to others and their deſcendants that ſway which had been formerly delegated and dependant on his will. Hence aroſe the modern conſtitution of diſtinct principalities, acknowledging one head in the perſon of an emperor. But ſhortly after the election of Conrade duke of Franconia to the throne, this new-gained authority of the princes became doubtful. However, after moſt violent diſturbances and confuſions, the regulations yielded to by Albert II. and his ſucceſſors, particularly by Frederick III. laid the foundation of the German conſtitution; but the power and form of which were afterwards improved by Maximilian. Before Charles V. mounted the throne, on the death of Maximilian, the electors formed a bulwark againſt the Imperial power, by an inſtrument called the *capitulation;* to which articles of government he and all emperors elected ſince have ſworn, previous to their inveſtiture with the Imperial dignity.

23 Of the electors. When the German monarchy received an elective form, the right of election was not limited to the great officers of ſtate, for other princes participated of this privilege. But the empire being governed by four dukes, the princes under their authority, in order to court their favour, gave to them the diſpoſal of their votes, and of thoſe of their vaſſals. The three archbiſhops alſo, who were neceſſarily preſent at the coronation, obtained the electoral dignity. However, beſide this origin of the modern electors, the high ſtations about court procured their poſſeſſors an influence over other members, and their general reſidence there gave them a ſolid advantage in their conſtant and early preſence at the diet of election. For in times of turbulence ſeveral emperors were elected, when the princes had not an opportunity to attend. And hence ſprung up a ſanction to that right, which the high officers of the houſehold had aſſumed, of electing without any conſultation of the other members of the empire. Pope Gregory X. too, either conceiving that they did poſſeſs, or willing that they ſhould acquire, this right, exhorted them in a bull to terminate the troubles of Germany by electing an emperor. And ſince that period they have been held as the ſole electors. But the poſſeſſion of this high power was ſtrengthened by a league amongſt themſelves, called the *electoral union*, which received additional confirmation from the emperor Louis of Bavaria, and was formally and fully ratified by that famous conſtitution of Charles IV. termed the *golden bull;* according to which, the territories and the high officers by which the electoral dignity is conveyed, muſt deſcend according to the right of primogeniture, and are indiviſible.

The golden bull declares the following number and titles of the electors: The archbiſhop of Mentz as great chancellor of the German empire; the elector of Cologne as great chancellor of the empire in Italy; the elector of Triers as great chancellor of the empire in Gaul and Arles; the king of Bohemia as cupbearer; the count Palatine as high ſteward; the duke of Saxony as grand marſhal; the margrave of Brandenburg as grand chamberlain. The number originally Germany. was ſeven, but the emperor Leopold created the duke of Lunenburg, anceſtor to our preſent Britiſh ſovereign, an elector; to whom the poſt of arch-treaſurer was afterwards given; and thus Hanover forms the eighth electorate. But this number cannot be increaſed by the emperor without a previous election by the electors themſelves; who, thus capable of electing and of being elected, may ſtyle themſelves *Coimperantes;* and they exerciſe part of the imperial authority, if a vacancy of the throne happen. But when or before 24 Election of this occurs, the election of the emperor is proceeded to the emperor. after the following manner: The elector of Mentz, before the lapſe of a month after the death of the emperor, ſummons, as great chancellor of the empire, the reſt of the electors to attend on ſome fixed day within the ſpace of three months from the date of the ſummons. The electors generally ſend their ambaſſadors to the place of election, which is held at Frankfort on the Mayne; but ſaving the right of the city of Frankfort, it may be held elſewhere.

When the diet of electors is aſſembled, they proceed to compoſe the capitulation, to which the emperor when elected is to ſwear. The capitulation being adjuſted, the elector of Mentz appoints a day for the election. When this day arrives, the gates of the city are ſhut, and the keys delivered to the elector of Mentz. The electors or their ambaſſadors, Proteſtants excepted, repair in great pomp to maſs; and after its celebration they take a ſolemn oath to chooſe, unbiaſſed and uninfluenced, the perſon that appears moſt proper for the imperial dignity. After this they repair to the ſacriſty, where the elector of Mentz firſt aſks, if there be any impediment known againſt their proceeding at preſent to an election; and next he obtains a promiſe, that the perſon elected by the majority ſhall be received as emperor. The declarations of the electoral ambaſſadors, in reſpect to thoſe two points, are recorded by two notaries of the empire. Then all witneſſes withdraw; and the elector of Mentz collecting the ſuffrages, which are *viva voce*, and giving his own laſt, the witneſſes are recalled, and he declares the perſon whom the electors have choſen. But the election is not complete, nor is the new emperor proclaimed, until the capitulation be ſworn to either by himſelf or by his ambaſſadors if he be abſent. From this time he is ſtyled king of the Romans until the coronation takes place; which ceremony confers the title of emperor. According to the golden bull, it ſhould be celebrated at Aix-la-Chapelle, out of reſpect to Charlemagne, who reſided there; but ſaving the right to Aix-la-Chapelle, it may take place elſewhere. The coronation is performed by the archbiſhop of Mentz or elector of Cologne. And, when he is ſeated on his throne, the duke of Saxony delivers into his hand the ſword of Charles the Great, with which he makes ſome knights of the holy Roman empire, and is alſo obliged to confer that honour upon ſuch others as are nominated by the reſpective electors. When he proceeds to dinner in the great hall, he is ſeated at a table elevated two ſteps higher than that of the electors, and is ſerved by counts of the empire. The electors, each of whom has alſo his table, are attended by the gentlemen of their reſpective courts. Theſe electors, who aſſiſt perſonally at the ceremony,

Germany. remony, ſit and eat at their own tables; but thoſe who are repreſented by ambaſſadors have only their tables covered out of form with plates, at which the ambaſſadors do not ſit.

For the benefit of the empire during the reign of an emperor, his preſumptive ſucceſſor may be elected king of the Romans. But this election confers at firſt a mere title; for by an expreſs article in his capitulation, the king of the Romans ſwears not to interfere with the government during the life of the emperor; but on his deceaſe the coronation confirms him emperor without a ſecond election.

Should there not be a king of the Romans, and the throne become vacant, the government is adminiſtered by vicars of the empire, who are the electors Palatine and of Saxony, as count palatine and arch-marſhal of the empire. Each has his diſtrict and tribunal of the vicariate; and by the golden bull it is eſtabliſhed, that all acts of the vicars are valid; but they are all fully confirmed by the emperor; which confirmation, by an article of his capitulation, he is bound to give.

There are alſo vicars of the emperor. Theſe officers are conſtituted by a delegation of the imperial power from the emperor to any prince of the empire, when he is unable to execute his authority himſelf. But theſe vicars ſtand accountable to the emperor; their acts may be annulled and their offices revoked, all dependent on the will of the emperor, and determinable at his pleaſure.

When the race of Charlemagne ceaſed to govern in Germany, the princes and ſtates aſſociated to continue the empire; and that its majeſty might be viſible, and its laws enforced, they agreed to chooſe an emperor. From this emperor all electors and princes except thoſe before 1582 receive inveſtiture of their dominions; counts and free cities from the Aulic council. But this inveſtiture is no more than a ſign of ſubmiſſion to the majeſty of the empire, which is depoſited in the emperor. For as the conſtituted members of the empire are dependent on that collective union from which they derive protection, they therefore ſhow this dependence on the emperor, becauſe he repreſents the majeſty of that union or of that empire; but in all other reſpects they are independent and free.

Theſe princes or ſovereigns may even wage war with the prince wearing the imperial crown, as poſſeſſed of other titles and dominions unconnected with his imperial ſtation. Nor can the ſovereignty of any member be affected ſo long as he remains loyal to the empire; which loyalty conſtitutes his duty, and ſecures him its protection. But ſhould he be guilty of any violation againſt the emperor, as head of the empire, ſuch a crime would commit him to the puniſhment of its laws, and he would be put under the ban. For this crime would be againſt that collective body of ſovereigns whoſe union conſtitutes the empire; and therefore any violation of that union is juſtly puniſhed with deprivation of theſe territories which render ſuch ſovereigns members of the empire. Nor can this puniſhment of the ban derogate from the dignity of thoſe princes who derive their ſovereignty from this conſtitution, and whoſe ſubjection is an act of their own conſent. However, no member of the empire can at preſent be put under the ban without being firſt heard, and without the concurrence of the electors, princes, Germany. and ſtates, being previouſly obtained.

25 Powers of the emperor.

The emperor is endowed with many privileges, and his power partly appears in the exerciſe of his reſerved rights, or the peculiar prerogatives annexed to the imperial dignity. He grants to princes the inveſtiture of their dominions; but to this he is bound as the laws direct. He confers titles, but promiſes that they ſhall be beſtowed only on ſuch perſons as will maintain their dignity, and can ſupport their rank. Beſides, he can give merely the title; for the power or privilege of prince or count can be obtained only from their reſpective bodies. But in ſome inſtances, even titles are of high importance. For the deſcendants of a prince are incapable of ſucceſſion, if their mother be of inferior rank to their father; but the conferring of a title ennobles her and removes the bar, if the collateral line conſents.

The emperor can alſo make cities, found univerſities, grant the privilege of fairs, &c. He can alſo diſpenſe with the tedious terms of minority, and empower princes to aſſume at an earlier age the government of their own dominions. He decides all rank and precedency, and has a power of *primæ preces*, that is, of granting for once in every chapter of the empire a vacant ſeat. But he is not above the law; for electors have not only choſen but depoſed emperors. However, the influence of the capitulation is to prevent ſuch rigorous proceedings: but ſhould the capitulation be violated, the college of electors might proceed to remonſtrance; and if theſe remonſtrances ſhould be without effect, in conjunction with the diet, they might reſort to more forcible remedies.

26 Diet of the empire.

The diet is that aſſembly of the ſtates in which the legiſlative power of the empire reſides; and is compoſed of the electors, princes, prelates, counts, and free cities of the empire. It has ſat ſince 1663, and is held uſually at Ratiſbon. The emperor, when preſent, preſides in perſon; when abſent, by his commiſſary, whoſe communication of propoſals from the emperor to the aſſembly is called the *commiſſorial decree*. The elector of Mentz, as chancellor of the empire, is director of the diet; and to his chancery are all things addreſſed that are to be ſubmitted to the empire; the reading of which by his ſecretary to the ſecretaries of the other miniſters at the diet is denominated *per dictaturam*, and conſtitutes the form of tranſmitting papers or memorials to the dictature of the empire.—The diet is compoſed of three diſtinct colleges, each of which has its particular director. The firſt college is that of electors; of which the archbiſhop of Mentz is director as firſt elector. The ſecond college is that of princes. It conſiſts of princes, archbiſhops, and biſhops; and of prelates, abbots, and counts, who are not conſidered as princes. Each prince ſpiritual and temporal has a vote, but prelates and counts vote by benches. The prelates are divided into two benches, the counts into four; and each bench has only one vote. The archduke of Auſtria and the archbiſhop of Saltzburg are alternately directors of the college of princes. The third college is that of the free cities of the empire; the director of which is the miniſter of the city in which the diet happens to ſit.

In

Germany. In all theſe colleges, the ſentiments of the majority are concluſive, except in reſpect of fundamental laws, which affect the whole empire, or ſuch matters as relate to religion. In theſe they muſt be unanimous.

Where religion is intereſted, the proceedings are alſo different. The colleges are then conſidered as conſiſting of two bodies, the evangelic and the catholic; and if any religious point be propoſed, it muſt meet not only the unanimous concurrence of the propoſing body, but muſt have the majority of the other to eſtabliſh it. This diſtinction aroſe from a conjunction called the *evangelic body;* which was formed by the Proteſtant ſtates and princes to guard the Proteſtant intereſt in Germany, by watching over the laws for the ſecurity of their religion, and, in caſe of violation, by obtaining redreſs from the imperial throne. For in any part of the empire, as in the palatinate, where the count is a Papiſt and the ſubjects are Proteſtants, ſhould oppreſſions ariſe, application would be made to the evangelic body through the director. The elector of Saxony is director of the evangelic body, though he is a Papiſt: but therefore his repreſentations in favour of the Proteſtants have more force; and beſide, ſhould he abuſe an office which inveſts him with conſiderable weight and influence, he could be inſtantly deprived of it.

The firſt two colleges are ſtyled ſuperior, and in effect conſtitute the diet: for all points that come before the diet, are generally firſt deliberated in the college of electors, and paſs from that to the college of princes; in which, if any objection ariſe, a free conference takes place between the directors of each college. And ſhould they, in conſequence of this free conference, concur, they invite the third college to accede to their joint opinion; which invitation is generally complied with: but ſhould this college return a refuſal, the opinion of the other two colleges is in ſome few caſes engroſſed in the chancery, and delivered to the emperor's commiſſary as the opinion of the empire. The opinion of the third college is merely mentioned at the cloſe. However, though the ſuperior colleges do in effect conſtitute the diet; yet the received maxim is, that no two colleges conſtitute a majority, that is, the majority of voices at the diet; nor can the emperor confirm the opinion of two colleges as an opinion of the diet. By the peace of Weſtphalia, a deciſive vote was recognized as a right of the imperial cities, which the two ſuperior colleges ſhould not infringe upon; their vote being, by the fundamental law, of equal weight with that of the electors and princes.

After a meaſure is approved of by the colleges, it is ſubmitted to his Imperial majeſty to receive his negative or confirmation. Should he approve the point, it is publiſhed in his name as the reſolution of the empire, which ſtates are exhorted to obey, and tribunals deſired to conſider as ſuch.

The diet not only makes and explains laws, but decides ambiguous caſes. It muſt alſo be conſulted before war is made; appoints the field marſhal who is to command the army, and aſſigns him his council of war. The diet alſo enters into and makes alliances, but uſually empowers the emperor to negociate them; and foreign ſtates have their ambaſſadors at the diet, but the diet ſends no miniſters to foreign courts.

Germany. In the origin of the empire, juſtice was adminiſtered in the diſtricts of the provinces by counts, and appeals lay from their courts to that of the emperor before the count palatine. But as civil broils ſhook the power of the emperor, they interrupted alſo the courſe of juſtice, &c. juſtice. The conſequent inconveniences cauſed ſeveral ſolicitations to be preferred from the ſtates to different emperors for the eſtabliſhment of a court of juſtice, which ſhould take cognizance of great as well as ſmall cauſes. And at length ſuch a court was erected by Maximilian I. under the title of the *Imperial Chamber at Worms*, in the year 1495; but was removed to Spires in 1533, and to Wetzlar in 1696, where it is now held. The members of this court are a judge of the chamber and 25 aſſeſſors, partly Proteſtants, partly Papiſts. The preſident is appointed by the emperor, the aſſeſſors by the ſtates. The court receives appeals from inferior juriſdictions, and deſides dubious titles; and all cauſes before it between prince and prince, or princes and private perſons, are adjudged according to the laws of the reſpective parties, or according to the Imperial law. The tribunal is under the inſpection of viſitors appointed by the ſtates; and, during their viſitation, the ſentences of the court are ſubject to reviſion. Appeals lie afterwards alſo from the judgment of the viſitors to that of the diet.

27 Adminiſtration of

28 Aulic council.

The emperors finding themſelves deprived of many of their powers, wiſhed to raiſe their prerogatives by forming a tribunal, of which they ſhould name the judge, and before whom cauſes in the laſt reſort ſhould come. But Maximilian foreſaw, in reſpect to the new tribunal, that though a conſciouſneſs of its importance made the ſtates ſtruggle for its erection, the expences of its eſtabliſhment would make them neglect its ſupport; and the event bore witneſs to his ſagacity. But when, through the omiſſions and negligence of the ſtates, there happened to be a ceſſation in the diſtribution of juſtice by the Imperial chamber, he revived his court of the count Palatine, or Aulic council. And in order to gain the quiet acquieſcence of the ſtates, under the maſk of a partition of power, and of generous moderation, he deſired them to add eight to the number of aſſeſſors, and the ſalaries of all ſhould be diſcharged by him. The ſtates ſwallowed the bait, but ſoon perceived that they had loſt part of their liberty.

The emperor, by keeping the tribunal always open, by filling its ſeats with men of firſt-rate talents, and by having its ſentences duly and ſpeedily executed, drew all cauſes before it. The ſtates remonſtrated, declaring that the Imperial chamber ought to be not only the ſupreme, but ſole tribunal of that kind. The emperor anſwered, that he had erected the Imperial chamber in conſequence of their ſolicitations; but as they had not ſupplied the tribunal with judges, he provided for that deficiency by a conſtant adminiſtration of juſtice in the eſtabliſhment of another.

The Aulic council now ſubſiſts with equal authority, each receiving appeals from inferior juriſdictions; but neither appealing to the other, as the *aernier reſort* from both muſt be had to the diet. However, to the Aulic council belong the reſerved rights of the emperor; and to the Imperial chamber alſo are annexed peculiar powers. The imperial chamber ſubſiſts during a vacancy

Germany. cancy of the throne under the authority of the vicars of the empire; whereas the Aulic council does not exiſt until appointed by the ſucceeding emperor.

The Aulic council conſiſts of a preſident, vice preſident, and 17 aſſeſſors, of whom ſix are Proteſtants. The vice chancellor of the empire is alſo entitled to a ſeat; and all decrees iſſuing from the council paſs through his hands to thoſe who are to execute them. This tribunal obtains for the emperor, through the appeals from the courts of other princes, a new authority beſide that which he poſſeſſes from his reſerved rights; but electors and ſome princes, as thoſe of Hanover, Auſtria, Brunſwick, Swediſh Pomerania, Heſſe, are free from this dependence on the emperor, to whoſe Aulic council their ſubjects cannot appeal; nor can it take cognizance of eccleſiaſtical or criminal cauſes, both of which appertain to territorial juſtice; which we ſhall preſently conſider when we have ſurveyed the executive inſtrument of Imperial juſtice.

The diviſion of the empire into circles is a regulation coeval with the eſtabliſhment of the Imperial chamber by Maximilian, in order to ſtrengthen the arm of juſtice with vigour to enforce its decrees. The original diviſion was into ſix circles, which are called the *ancient circles;* and are, Bavaria, Franconia, Suabia, Lower Saxony, the Upper Rhine, and Weſtphalia; but the powerful princes, who at firſt declined bringing their dominions under the form of circles, were led by a political fineſſe of the emperors to adopt the regulation, and increaſe the number to ten, by forming the four new circles of Auſtria, Burgundy, the Electorate Circle, and Upper Saxony.

Over theſe circles preſide directors, to whom the tribunals of juſtice commit the execution of their decrees. The ſix old circles have two directors each, the four new have one each. The office of director is permanent and hereditary, as it belongs always to the firſt prince in the circle, upon whom it confers high authority; for all the decrees of the Imperial chamber and Aulic council are of no avail unleſs the director will execute them.

The directors of the circles are not only inſtruments of war but of peace: for in caſe of an Imperial war, they are to collect the troops of the circle; and if any ſtate or prince of their reſpective circles ſuffers violation from others, they are to yield protection and enforce the peace; or ſhould there be any tumultuous upriſings of the people, the ſuppreſſion of ſuch belongs to them.

The emperor is the executive inſtrument of the whole empire; the directors are ſuch of the conſtitutive parts called circles. The proſperity and ſecurity of which being at ſtake, the directors, as preſidents, muſt hold frequent diets in their reſpective circles, in order to conſult on and adopt ſalutary meaſures for their ſafety and welfare: but as the intereſts of thoſe near to us are generally ſo intimately blended with our own, that the good of either cannot be purſued without the mutual concurrence of both, there ariſe negotiations on particular points between the diets of different circles, which are therefore ſtyled *confederate circles;* and theſe negotiations being more frequent amongſt the circles of the Upper and Lower Rhine, or Weſtphalia, they are denominated the *correſponding circles.*

Every prince is ſovereign in his own country; and may enter into alliances, and purſue by all political Germany. meaſures his own private intereſts, as other ſovereigns do; for if even an imperial war be declared, he may remain neuter if the ſafety of the empire be not at ſtake.

29 Powers of the German princes.

Each ſtate or ſovereign appoints in general three colleges for its government. The firſt is the *geheimderath*, or privy council; the ſecond is the *regierung*, or regency; the third the *renthcammer*, or chamber of finances. Each of theſe has a preſident; and a member of the firſt college is always preſident of the ſecond. The geheimderath repreſents the prince, and ſuperintends the other two. The regierung regulates limits of territories, holds conferences with other princes, and is in moſt countries a court of juſtice: however, in ſome ſtates there is alſo a court of juſtice called *juſtitz department.* And beſides the right of conferences aſſigned to the regierung by the ſovereign, when there are diſputes between princes, there is alſo an *auſtrage*, or arbitration appointed in order to decide them. Attention muſt be paid to this privilege of princes, who muſt be called on to appoint an auſtrage before reſort be had to the Imperial tribunal, but to which there ſtill lies an appeal from the judgment of the auſtrage. The renthcammer attends to the regulation of domains and eſtates, to the territorial revenues, and management of the taxes.

Every ſovereign or prince is arbitrary in laws of policy, but not of revenue; for no new tax or impoſt can be laid on his country without the conſent of the nobles and ſubjects. For this purpoſe, on the *land tag*, or day on which his ſubjects are to be convened, which is once in the period of four or five years, and at no other time can he aſſemble them, he calls together the nobles and commiſſaries or deputies of the towns of his dominions. The nobles uſually attend in perſon, but may ſend repreſentatives. To this aſſembly the prince propoſes the taxes, &c. and a majority of voices diſpoſes of the meaſures.

Villages, though conſiderable, ſend no deputies to this aſſembly; becauſe they are either already repreſented by their reſpective lords, or becauſe they rank too low, being in a ſtate of vaſſalage when compared to towns: for their inhabitants muſt mend highways, and can be impreſſed as ſoldiers; from both of which inhabitants of towns are exempt.

On the land tag, the reſpective quotas alſo of each place are fixed, in order to diſcharge the prince's contingent in caſe of an Imperial war.

30 Military force and annual revenue.

There is no fixed ſtanding army of the empire; but the various ſtates furniſh their quotas purſuant to the agreement of 1681, when called upon by the diet in caſe of war, viz.

	Foot.	*Horſe.*
Upper Saxony -	2707	1321
Lower Saxony -	2707	1321
Weſtphalia - -	2707	1321
Upper Rhine -	2853	491
Lower Rhine -	2707	600
Burgundy - -	2707	1321
Franconia - -	1902	980
Auſtria - -	5507	2521
Bavaria - -	1494	800
Suabia - -	2707	1321
Total	27,998	11,997

Germany. The whole number of forces in the ſervice of the ſeveral German princes has been ſtated at half a million; others calculate, that the eccleſiaſtical princes can furniſh 74,500 men, the temporal princes 379,000, and the emperor 90,000, as head of the houſe of Auſtria. Total 543,500.

The revenue accruing to the emperor as ſuch in time of peace, is very trifling, only about 20,000 crowns, being the contributions of a few imperial towns; but in caſe of war, extraordinary aids, called *Roman Months*, laid on by the diet, are contributed by the different circles at the following rate for raiſing $1\frac{1}{2}$ millions of florins, viz.

	Florins.	*Ktr.*
Upper Saxony -	156,360	15
Lower Saxony -	156,360	15
Weſtphalia - -	156,360	15
Upper Rhine - -	101,411	30
Lower Rhine - -	105,654	5
Burgundy - -	156,360	15
Franconia - -	113,481	25
Auſtria - -	306,390	20
Bavaria - -	91,261	5
Suabia - -	156,360	15
Total	1,499,997	40

The actual revenue of all Germany has been calculated at nearly 18,000,000l. ſterling, or 100 millions of dollars.

31 Productions and commerce. From the great extent of the empire, every variety of ſoil is to be met with; but it is upon the whole more fertile than otherwiſe. The middle parts are moſt productive in corn and cattle; the ſouthern abound with excellent wines and fruits. The northern parts, from their coldneſs, are rather unfavourable to vegetation; however, agriculture throughout improves exceedingly. Their mines, though early explored, ſtill continue great ſources of wealth. They produce, excepting tin, almoſt every mineral. Of quickſilver, one mine alone is computed to yield 50,000 pounds weight a-year. They furniſh the fineſt ſort of clay for porcelain, and have excellent and extenſive ſalt works.

From the central ſituation of Germany, its commerce with the reſt of Europe is very extenſive. Its minerals are decidedly the firſt native articles for trade; after which its medicinal waters, ſalt, hemp, flax, linen, ſilk, wines, fruits, corn, cattle, ſtuffs, cloths, timber, porcelain, wrought iron and ſteel, drugs, oil, and colours, are the principal. The artizans furniſhed by the revocation of the edict of Nantz, enable Germany no longer to ſtand in need of the wrought ſilks of other countries. Great commercial fairs ſtill exiſt in Germany, and it is conſidered upon the whole that the balance of trade is in its favour.

32 Character of the ancient Germans. With regard to the character of the ancient Germans, they are deſcribed to us by the Greek and Roman writers as reſembling the Gauls; and differing from other nations by the largeneſs of their ſtature, ruddy complexion, blue eyes, and yellow buſhy hair, haughty and threatening looks, ſtrong conſtitutions, and being proof againſt hunger, cold, and all kinds of hardſhip.

Their native diſpoſition diſplayed itſelf chiefly in their martial genius, and in their ſingular fidelity. The former of theſe they did indeed carry to ſuch an exceſs as came little ſhort of downright ferocity; but, as to the latter, they not only valued themſelves highly upon it, but were greatly eſteemed by other nations for it; inſomuch that Auguſtus, and ſeveral of his ſucceſſors, committed the guard of their perſons to them, and almoſt all other nations either courted their friendſhip and alliance, or hired them as auxiliaries; though it muſt be owned, at the ſame time, that their extreme love of liberty, and their hatred of tyranny and oppreſſion, have often hurried them to treachery and murder, eſpecially when they have thought themſelves ill uſed by thoſe who hired them; for in all ſuch caſes they were eaſily ſtirred up, and extremely vindictive. In other caſes, Tacitus tells us, they were noble, magnanimous, and beneficent, without ambition to aggrandize their dominions, or invading thoſe from whom they received no injury; rather chooſing to employ their ſtrength and valour defenſively than offenſively; to preſerve their own, than to ravage their neighbours. Germany.

Their friendſhip and intercourſe was rather a compound of honeſt bluntneſs and hoſpitality, than of wit, humour, or gallantry. All ſtrangers were ſure to meet with a kind reception from them to the utmoſt of their ability: even thoſe who were not in a capacity to entertain them, made it a piece of duty to introduce them to thoſe who could; and nothing was looked upon as more ſcandalous and deteſtable, than to refuſe them either the one or the other. They do not ſeem, indeed, to have had a taſte for grand and elegant entertainments; they affected in every thing, in their houſes, furniture, diet, &c. rather plainneſs and ſimplicity, than ſumptuouſneſs and luxury. If they learned of the Romans and Gauls the uſe of money, it was rather becauſe they found it more convenient than their ancient way of bartering one commodity for another; and then they preferred theſe ancient coins which had been ſtamped during the times of the Roman liberty, eſpecially ſuch as were either milled or cut in the rims, becauſe they could not be ſo eaſily cheated in them as in ſome others, which were frequently nothing but copper or iron plated over with ſilver. This laſt metal they likewiſe preferred before gold, not becauſe it made a greater ſhow, but becauſe it was more convenient for buying and ſelling: And as they became in time more feared by, or more uſeful to, the Romans; ſo they learned how to draw enough of it from them to ſupply their whole country, beſides what flowed to them from other nations.

As they deſpiſed ſuperfluities in other caſes, ſo they did alſo in the connubial way: every man was contented with one wife, except ſome few of their nobles, who allowed themſelves a plurality, more for ſhow than pleaſure; and both were ſo faithful to each other, and chaſte, true, and diſintereſted in their conjugal affection, that Tacitus prefers their manners in this reſpect to thoſe of the Romans. The men fought not dowries from their wives, but beſtowed them upon them. Their youth, in thoſe cold climes, did not begin ſo ſoon to feel the warmth of love as they do in hotter ones: it was a common rule with them not to marry young; and theſe were moſt eſteemed who continued longeſt in celibacy, becauſe they looked upon it as an effectual means to make them

Germany. them grow tall and ſtrong; and to marry, or be concerned with a woman, before they were full 20 years old, was accounted ſhameful wantonneſs. The women ſhared with their huſbands not only the care of the family, and the education of their children, but even the hardſhips of war. They attended them in the field, cooked the victuals for them, dreſſed their wounds, ſtirred them up to fight manfully againſt their enemies, and ſometimes have, by their courage and bravery, recovered a victory when it was upon the point of being ſnatched from them. In a word, they looked upon ſuch conſtant attendance on them, not as a ſervitude, like the Roman dames, but as a duty and an honour. But what appears to have been ſtill a harder fate upon the ancient German dames was, that their great Odin excluded all thoſe from his *valhalla* or paradiſe, who did not, by ſome violent death, follow their deceaſed huſbands thither. Yet notwithſtanding their having been anciently in ſuch high repute for their wiſdom and ſuppoſed ſpirit of prophecy, and their continuing ſuch faithful and tender helpmates to their huſbands, they ſunk in time ſo low in their eſteem, that, according to the old Saxon law, he that hurt or killed a woman was to pay but half the fine that he ſhould have done, if he had hurt or killed a man.

33 Their funerals. There is ſcarcely any one thing in which the Germans, though ſo nearly allied in moſt of their other cuſtoms to the Gauls, were yet more oppoſite to them than in their funerals. Thoſe of the latter were performed with great pomp and profuſion; thoſe of the former were done with the ſame plainneſs and ſimplicity which they obſerved in all other things; the only grandeur they affected in them was, to burn the bodies of their great men with ſome peculiar kinds of wood; but then the funeral pile was neither adorned with the clothes and other fine furniture of the deceaſed, nor perfumed with fragrant herbs and gums: each man's armour, that is, his ſword, ſhield, and ſpear, were flung into it, and ſometimes his riding horſe. The Danes, indeed, flung into the funeral pile of a prince, gold, ſilver, and other precious things, which the chief mourners, who walked in a gloomy guiſe round the fire, exhorted the byſtanders to fling liberally into it in honour of the deceaſed. They afterwards depoſited their aſhes in urns, like the Gauls, Romans, and other nations; as it plainly appears, from the vaſt numbers which have been dug up all over the country, as well as from the ſundry diſſertations which have been written upon them by ſeveral learned moderns of that nation. One thing we may obſerve, in general, that whatever ſacrifices they offered for their dead, whatever preſents they made to them at their funerals, and whatever other ſuperſtitious rites they might perform at them, all was done in conſequence of thoſe excellent notions which their ancient religion had taught them, the immortality of the ſoul, and the bliſs or miſery of a future life.

34 Their belief of a future ſtate. It is impoſſible, indeed, as they did not commit any thing to writing till very lately, and as none of the ancient writers have given us any account of it, to gueſs how ſoon the belief of their great Odin, and his paradiſe, was received among them. It may, for aught we know, have been older than the times of Tacitus, and he have known nothing of it, by reaſon of their Germany. ſcrupulous care in concealing their religion from ſtrangers: but as they conveyed their doctrines to poſterity by ſongs and poems, and moſt of the northern poets tell us that they have drawn their intelligence from thoſe very poems which were ſtill preſerved among them; we may rightly enough ſuppoſe, that whatever doctrines are contained in them, were formerly profeſſed by the generality of the nation, eſpecially ſince we find their ancient practice ſo exactly conformable to it. Thus, ſince the ſureſt road to this paradiſe was, to excel in martial deeds, and to die intrepidly in the field of battle; and ſince none were excluded from it but baſe cowards, and betrayers of their country; it is natural to think, that the ſignal and exceſſive bravery of the Germans flowed from this ancient belief of theirs: and, if their females were ſo brave and faithful as not only to ſhare with their huſbands all the dangers and fatigues of war, but at length to follow them by a voluntary death, into the other world; it can hardly be attributed to any thing elſe but a ſtrong perſuaſion of their being admitted to live with them in that place of bliſs. This belief, therefore, whether received originally from the old Celtes, or afterwards taught them by the ſince deified Odin, ſeems, from their general practice, to have been univerſally received by all the Germans, though they might differ one from another in their notions of that future life.

The notion of a future happineſs obtained by martial exploits, eſpecially by dying ſword in hand, made them bewail the fate of thoſe who lived to an old age, as diſhonourable here, and hopeleſs hereafter: upon which account, they had a barbarous way of ſending them into the other world, willing or not willing. And this cuſtom laſted ſeveral ages after their receiving Chriſtianity, eſpecially among the Pruſſians and Venidi; the former of whom, it ſeems, deſpatched by a quick death, not only their children, the ſick, ſervants, &c. but even their parents, and ſometimes themſelves; and among the latter we have inſtances of this horrid parricide being practiſed even in the beginning of the 14th century. All that need be added is, that, if thoſe perſons, thus ſuppoſed to have lived long enough, either deſired to be put to death, or at leaſt ſeemed cheerfully to ſubmit to what they knew they could not avoid, their exit was commonly preceded with a faſt, and their funeral with a feaſt; but if they endeavoured to ſhun it, as it ſometimes happened, both ceremonies were performed with the deepeſt mourning. In the former, they rejoiced at their deliverance, and being admitted into bliſs; in the latter, they bewailed their cowardly excluding themſelves from it. Much the ſame thing was done towards thoſe wives who betrayed a backwardneſs to follow their dead huſbands.

35 Remarkable for drinking to exceſs. We muſt likewiſe obſerve, that, in theſe funerals, as well as in all their other feaſts, they were famed for drinking to exceſs; and one may ſay of them, above all the other deſcendants of the ancient Celtes, that their hoſpitality, banquets, &c. conſiſted much more in the quantity of ſtrong liquors, than in the elegance of eating. Beer and ſtrong mead, which were their natural drink, were looked upon as the chief promoters of health, ſtrength, fertility, and bravery; upon which account, they made no ſcruple to indulge themſelves to

Germany.

the utmoſt in them, not only in their feaſts, and eſpecially before an engagement, but even in their common meals.

36 Character of the modern Germans.

The modern Germans in their perſons are tall and ſtrong built. The ladies have generally fine complexions; and ſome of them, eſpecially in Saxony, have all the delicacy of features and ſhape that are ſo bewitching in a certain iſland of Europe.

Both men and women affect rich dreſſes, which in faſhion are the ſame as in France and England, but the better ſort of men are exceſſively fond of gold and ſilver lace, eſpecially if they are in the army. The ladies at the principal courts differ not much in their dreſs from the French and Engliſh, only they are not ſo exceſſively fond of paint as the former. At ſome courts they appear in rich furs; and all of them are loaded with jewels, if they can obtain them. The female part of the burghers families, in many German towns, dreſs in a very different manner, and ſome of them inconceivably fantaſtic, as may be ſeen in many prints publiſhed in books of travels; but in this reſpect they are gradually reforming, and many of them make quite a different appearance in their dreſs from what they did 30 or 40 years ago. As to the peaſantry and labourers, they dreſs as in other parts of Europe, according to their employments, conveniency, and opulence. In Weſtphalia, and moſt other parts of Germany, they ſleep between two feather beds, or rather the upper one of down, with ſheets ſtretched to them, which by uſe becomes a very comfortable practice. The moſt unhappy part of the Germans are the tenants of little needy princes, who ſqueeze them to keep up their own grandeur; but, in general, the circumſtances of the common people are far preferable to thoſe of the French.

The Germans are naturally a frank, honeſt, hoſpitable people, free from artifice and diſguiſe. The higher orders are ridiculouſly proud of titles, anceſtry, and ſhow. The Germans, in general, are thought to want animation, as their perſons promiſe more vigour and activity than they commonly exert even in the field of battle. But when commanded by able generals, eſpecially the Italians, ſuch as Montecuculi and Prince Eugene, they have done great things, both againſt the Turks and the French. The Imperial arms have ſeldom made any remarkable figure againſt either of thoſe two nations, or againſt the Swedes or Spaniards, when commanded by German generals. This poſſibly might be owing to the arbitrary obſtinacy of the court of Vienna; for in many wars the Auſtrians have exhibited prodigies of military valour and genius.

Induſtry, application, and perſeverance, are the great characteriſtics of the German nation, eſpecially the mechanical part of it. Their works of art would be incredible were they not viſible, eſpecially in watch and clockmaking, jewellery, turnery, ſculpture, drawing, painting, and certain kinds of architecture. The Germans have been charged with intemperance in eating and drinking; and perhaps not unjuſtly, owing to the vaſt plenty of their country in wine and proviſions of every kind. But thoſe practices ſeem now to be wearing out. At the greateſt tables, though the gueſts drink pretty freely during dinner, yet the repaſt is commonly finiſhed by coffee, after three or four public toaſts have been drank. But no people have more feaſting at marriages, funerals, and birth-days. Germany.

The German nobility are generally men of ſo much honour, that a ſharper in other countries, eſpecially in England, meets with more credit if he pretends to be a German, than of any other nation.

The merchants and tradeſmen are very civil and obliging. All the ſons of noblemen inherit their father's titles, which greatly perplexes the heralds and genealogiſts of that country. This perhaps is one of the reaſons why the German huſbands are not quite ſo complaiſant as they ought otherwiſe to be to their ladies, who are not entitled to any pre-eminece at the table; nor indeed do they ſeem to affect it, being far from either ambition or loquacity, though they are ſaid to be ſomewhat too fond of gaming. From what has been premiſed, it may eaſily be conceived, that many of the German nobility, having no other hereditary eſtate than a high ſounding title, eaſily enter into their armies, and thoſe of other ſovereigns. Their fondneſs for title is attended with many other inconveniencies. Their princes think that the cultivation of their lands, though it may treble their revenue, is below their attention; and that, as they are a ſpecies of beings ſuperior to labourers of every kind, they would demean themſelves in being concerned in the improvement of their grounds.

37 Amuſements.

The domeſtic diverſions of the Germans are the ſame as in England; billiards, cards, dice, fencing, dancing, and the like. In ſummer, people of faſhion repair to places of public reſort, and drink the waters. As to their field diverſions, beſides their favourite one of hunting they have bull and bear baiting, and the like. The inhabitants of Vienna live luxurioufly, a great part of their time being ſpent in feaſting and carouſing; and in winter, when the ſeveral branches of the Danube are frozen over, and the ground covered with ſnow, the ladies take their recreation in ſledges of different ſhapes, ſuch as griffins, tygers, ſwans, ſcallop-ſhells, &c. Here the lady ſits, dreſſed in velvet, lined with rich furs, and adorned with laces and jewels, having on her head a velvet cap; and the ſledge is drawn by one horſe, ſtag, or other creature, ſet off with plumes of feathers, ribands, and bells. As this diverſion is taken chiefly in the night-time, ſervants ride before the ſledge with torches, and a gentleman ſitting on the ſledge behind guides the horſe.

38 Religion and learning.

The Reformation firſt ſpread in Germany to moſt advantage; and ſince the religious peace of 1555, there have been eſtabliſhed the Roman Catholic, prevailing moſtly in the ſouth; the Lutheran in the north; and the Calviniſt, called alſo the *Reformed*, near the Rhine. Civil wars conſiderably deranged this ſettlement: it was, however, eſtabliſhed by the celebrated peace of Weſtphalia, that the religion of the Seven States ſhould remain as in 1624. The Romiſh ſuperior clergy conſiſt of 8 archbiſhops, 40 biſhops, and many abbots. The Proteſtant clergy are governed by conſiſtories under the ſovereign of each ſtate. The *Corpus Catholicorum* is under the direction of the archbiſhop, elector of Mentz; and the *Corpus Evangelicorum*, or Proteſtants, under the elector of Saxony; who have the care of the public concerns of their reſpective bodies.

Literature

E. Mitchell sculp.

Germany || Germination.

Literature is in a very advanced ſtate throughout almoſt all Germany, but particularly in the Proteſtant ſtates. It is but about half a century ſince the German language has been purified and cultivated; ſince which various works of taſte and elegance, as well as ſuperior productions in the different walks of ſcience, have appeared in it. There are 38 univerſities in Germany; 19 Proteſtant, 17 Catholic, and two which partake of both; beſides a number of literary ſocieties and academic inſtitutions: and education in general is particularly attended to even in the very loweſt ranks.

We have ſaid nothing of the part which the ſtates of Germany, either individually or as a body, naturally took in the late revolution in France. It would indeed be only an unneceſſary repetition of the hiſtory of tranſactions already detailed under France and Britain. Of the changes in the government of particular ſtates, or rather in the names of the rulers, we ſhall ſay nothing. Theſe changes, made at the inſtigation of France, will probably not ſatisfy the inordinate ambition and growing power of her preſent ruler, and therefore will not be permanent.

GERMEN, the ſeed bud; defined by Linnæus to be the baſe of the piſtillum, which contains the rudiments of the ſeed; and, in progreſs of vegetation, ſwells and becomes the ſeed veſſel.

In aſſimilating the vegetable and animal kingdoms, Linnæus denominates the ſeed bud the *ovarium* or *uterus* of plants; and affirms its exiſtence to be chiefly at the time of the diſperſion of the male duſt by the antheræ; as, after its impregnation, it becomes a ſeed veſſel. See BOTANY.

GERMEN, by Pliny and the ancient botaniſts, is uſed to ſignify a bud containing the rudiments of the leaves. See GEMMA.

GERMINATION, among botaniſts, comprehends the preciſe time which the ſeeds take to riſe after they have been committed to the ſoil.—The different ſpecies of ſeeds are longer or ſhorter in riſing according to the degree of heat which is proper to each. Millet, wheat, and ſeveral of the graſſes, riſe in one day; blite, ſpinach, beans, muſtard, kidney beans, turnips, and rocket, in three days; lettuce and dill, in four; cucumber, gourd, melon, and creſs, in five; radiſh and beet, in ſix; barley, in ſeven; orach, in eight; purſlain, in nine; cabbage, in ten; hyſſop, in thirty; parſley, in forty or fifty days; peach, almond, walnut, cheſnut, peony, horned poppy, hypecoum, and ranunculus falcatus, in one year; roſe buſh, cornel tree, hawthorn, medlar, and hazel nut, in two. The ſeeds of ſome ſpecies of orchis, and of ſome liliaceous plants, never riſe at all. Of ſeeds, ſome require to be ſowed almoſt as ſoon as they are ripe, otherwiſe they will not ſprout or germinate. Of this kind are the ſeeds of coffee and fraxinella. Others, particularly thoſe of the pea-bloom flowers, preſerve their germinating faculty for a ſeries of years. Mr Adanſon aſſerts, that the ſenſitive plant retains that virtue for 30 or 40 years.

Air and water are the agents of germination. The humidity of the air alone makes ſeveral ſeeds to riſe that are expoſed to it. Seeds too are obſerved to riſe in water, without the intervention of earth; but water without air is inſufficient. Mr Homberg's experiments on this head are deciſive. He put ſeveral ſeeds under the exhauſted receiver of an air pump, with a view to eſtabliſh ſomething certain on the cauſes of germination. Some of them did not riſe at all; and the greateſt part of thoſe which did, made very weak and feeble productions. Thus it is for want of air that ſeeds which are buried at a very great depth in the earth, either thrive but indifferently, or do not riſe at all. They frequently preſerve, however, their germinating virtue for many years within the bowels of the earth; and it is not unuſual, upon a piece of ground being newly dug to a conſiderable depth, to obſerve it ſoon after covered with ſeveral plants, which had not been ſeen there in the memory of man. Were this precaution frequently repeated, it would doubtleſs be the means of recovering certain ſpecies of plants which are regarded as loſt; or which perhaps, never coming to the knowledge of botaniſts, might hence appear the reſult of a new creation. Some ſeeds require a greater quantity of air than others. Thus purſlain which does not riſe till after lettuce in the free air, riſes before it *in vacuo;* and both proſper but little, or periſh altogether, while creſſes vegetate as freely as in the open air.

Germination || Gerund.

GERONTES, in antiquity, a kind of judges, or magiſtrates, in ancient Sparta, anſwering to what the Areopagites were at Athens. See AREOPAGUS.

The word is formed of the Greek γερων, which ſignifies "old man." Whence alſo the words *gerontic*, ſomething belonging to an old man; and *Geronicon*, a famous book among the modern Greeks, containing the lives of the ancient monks. The ſenate of gerontes was called *geruſia*, that is, aſſembly or council of old men.

The gerontes were originally inſtituted by Lycurgus: their number, according to ſome, was 28; and, according to others, 32. They governed in conjunction with the king, whoſe authority they were intended to balance, and to watch over the intereſts of the people. Polybius defines their office in few words, when he ſays, *per ipſos, et cum ipſis, omnia adminiſtrari.* None were to be admitted into this office under 60 years of age, and they held it for life. They were ſucceeded by the ephori.

GEROPOGON, a genus of plants belonging to the ſyngeneſia claſs, and in the natural method ranking under the 49th order, *Compoſitæ*. See BOTANY *Index*.

GERRETZ. See REMBRANDT.

GERVAISE, or GERVASE, of Tilbury, a famous Engliſh writer of the 13th century; thus named from his being born at Tilbury on the Thames. He was nephew to Henry II. king of England; and was in great credit with Otho IV. emperor of Germany, to whom he dedicated a Deſcription of the World, and a Chronicle. He alſo compoſed a Hiſtory of England, that of the Holy Land, and other works.

GERUND, in *Grammar*, a verbal noun of the neuter gender, partaking of the nature of a participle, declinable only in the ſingular number, through all the caſes except the vocative; as nom. *amandum*, gen. *amandi*, dat. *amando*, accuſ. *amandum*, abl. *amando*. The word is formed of the Latin *gerundivus*, and that from the verb *gerere*, "to bear."

The *gerund* expreſſes not only the *time*, but alſo the *manner* of an action; as, "he fell in running poſt."—It differs from the participle, in that it expreſſes the *time*, which

Gerund ‖ Geſner.

which the participle does not; and from the tenſe properly ſo called, in that it expreſſes the *manner*, which the tenſe does not. See GRAMMAR.

GERUNDA, in *Ancient Geography*, a town of the Auſetani, in the Hither Spain, on the ſouth or right ſide of the river Sambroca. *Gerundenſes*, the people, Now *Gironne* in Catalonia, on the Ter. E. Long. 2. 35. N. Lat. 42.

GESNER, CONRAD, a celebrated phyſician and naturaliſt, was born at Zurich in 1516. Having finiſhed his ſtudies in France, he travelled into Italy, and taught medicine and philoſophy in his own country with extraordinary reputation. He was acquainted with the languages; and excelled ſo much in natural hiſtory, that he was ſurnamed the *Pliny of Germany*. He died in 1564, leaving many works behind him; the principal of which are, 1. A hiſtory of animals, plants, and foſſils; 2. *Bibliotheca Univerſalis*. A Greek and Latin lexicon. This author is by Boerhaave emphatically ſtyled *Monſtrum Eruditionis*, "a prodigy of learning." Thoſe indeed (as Mr Coxe obſerves in his Letters on Switzerland) "who are converſant with the works of this great ſcholar and naturaliſt, cannot repreſs their wonder and admiration at the amplitude of his knowledge in every ſpecies of erudition, and the variety of his diſcoveries in natural hiſtory, which was his peculiar delight. Their wonder and admiration is ſtill further augmented, when they conſider the groſs ignorance of the age which he helped to enlighten, and the ſcanty ſuccours he poſſeſſed to aid him in thus extending the bounds of knowledge; that he compoſed his works, and made thoſe diſcoveries which would have done honour to the moſt enlightened period, under the complicated evils of poverty, ſickneſs, and domeſtic uneaſineſs."

GESNER, *Solomon*, the celebrated author of the death of Abel and many other admired works in the German language, was born at Zurich in the year 1730. In his early years he ſhowed very few ſigns of ſuperior abilities; and his progreſs in the rudiments of education was ſo ſlow, that his maſter gave him up as incapable of any greater attainments than writing and the four firſt rules of arithmetic. Upon this he was placed under a clergyman in the neighbourhood, a relation of his father's, and who ſhowed himſelf better acquainted with the art of diſcovering the natural inclinations of his pupils. This gentleman often carried young Geſner with him into the fields, where he made him obſerve the beauties of nature; and finding that he took greater pleaſure in ſuch leſſons, and ſeemed to liſten to them with peculiar attention, he occaſionally repeated ſome of the moſt ſtriking paſſages of the ancient authors, who have written on theſe ſubjects, in the moſt agreeable and pleaſing manner. By this ingenious artifice, the mind of young Geſner began to open, and its powers to expand; and it is, perhaps, owing to this circumſtance, that he became ſo fond of the language of Virgil and Theocritus. When he arrived at a proper age to think of purſuing ſome line of buſineſs, Mr Geſner made choice of that of a bookſeller, which was the profeſſion of his father, and in ſome meaſure of his family. Of five houſes at Zurich in the printing and bookſelling buſineſs, two were occupied by Geſners: one belonged to two brothers of that name; and the other, that in which our poet had a ſhare, was known by the firm of *Orel, Geſner, and Company*. It was known alſo by the extent of its correſpondence, and by the choice and elegance of the works which it gave to the public. Geſner.

Though Mr Geſner was a bookſeller, he did not, however, damp his genius, by ſubmitting to the drudgery of buſineſs. He indulged himſelf freely in purſuing his favourite object, and his partners never envied him that time which he devoted to meditation and to ſtudy. In 1752, he made a tour through Germany, not ſo much for the purpoſe of extending his commerce, as to ſee and be acquainted with thoſe authors who have done honour to their country. The following circumſtance, which occurred during this tour, deſerves to be mentioned, as it is ſtrikingly characteriſtic of that timidity which often accompanies true genius. When Mr Geſner was at Berlin, he was admitted into a literary ſociety, of which Gleim and Leſſing were members. Each of the authors who compoſed it uſed to read in turn ſome pieces of their own compoſition, and Mr Geſner was very deſirous of ſubmitting to theſe able critics a ſmall work, which was his firſt attempt; but was far from reſembling thoſe poets, whom Horace and other ſatiriſts have ridiculed, and who ſtun every one they meet by reciting their verſes before them. As each of the members had done reading, Geſner was obſerved to move his hand with a kind of tremor towards his pocket, and to draw it back again without the manuſcript which he ought to have produced. Having not as yet publiſhed any thing, none of the company could gueſs the cauſe of a motion which his modeſty prevented him from explaining. The work which he had not the courage to ſhow, was his ſmall poem, entitled *Night*, which he publiſhed on his return to Zurich in 1753. It was conſidered as an original, of which no model is to be found among the moderns; but in the opinion of the author, it was only a piece of imaginary painting, or, to uſe an expreſſion of his own, in one of his letters to Mr Huber who has tranſlated his works, "A caricature compoſed in the moments of folly or intoxication." In this little poem he has introduced a ſhort epiſode on the origin of the glow-worm, containing a poetical explanation of this natural phoſphorus, which has all the beauty of Ovid's Metamorphoſes without their prolixity. The ſucceſs of this eſſay emboldened the too timid muſe of our young bookſeller, and he publiſhed a paſtoral romance, called *Daphnis*, in three cantos. The applauſe that was deſervedly beſtowed upon this performance induced the author to publiſh, ſome time after, his Idylls and ſome other rural poems in imitation of thoſe of Theocritus. Paſtoral poetry, which at this time was little known in Germany but by tranſlations from foreign poets, began to find many partizans, and to be preferred to every other kind. Deſirous, therefore, of tracing out a new path for himſelf, our poet thought that he could not do a more acceptable ſervice to his countrymen, than to paint the felicity of innocence and rural life, and the tender emotions of love and gratitude. The only author worthy of notice who had preceded Mr Geſner in this career, was Mr Roſt of Leipſic, whoſe paſtoral poems appeared for the firſt time in 1744. This writer poliſhed the language of the German ſhepherds; he had addreſs enough to unite ſpirit and ſimplicity in a kind of

Geſner. of writing which appears inſipid without the former, and which becomes unnatural and diſguſting if it is too abundant. He ſometimes throws a delicate veil over thoſe images which are deficient in decency, but it is to be regretted that it is often too light. Such was the antagoniſt againſt whom Geſner had to contend. Our poet, however, purſued a different courſe. Inſtead of placing, like Roſt, his ſcenes in modern times, he goes back with Theocritus to the golden age, that happy age which we are fond of reviewing when our paſſions are calm, and when freed from thoſe anxious cares which hurry us beyond ourſelves, we contemplate amidſt tranquillity the beauties and fertility of the country. The characters of Geſner's Idylls, therefore, are taken from thoſe ſocieties which exiſt no longer but in the remembrance, or rather the imagination. His ſhepherds are fathers, children, and huſbands, who bluſh not at theſe titles ſo dear to nature, and to whom generoſity, beneficence, and reſpect for the Deity are ſentiments no leſs familiar than love. Theſe Idylls were the principal and favourite object of his purſuit, and that part of his works which acquired him the greateſt reputation, eſpecially among his countrymen. His death of Abel, which is well known, was publiſhed for the firſt time in 1758. It is written, like the reſt of his pieces, in poetical proſe; and was ſo much ſought after, that it went through no leſs than three editions in the ſpace of a year, without ſpeaking of the ſpurious ones which appeared in Holland, at Berlin, and in France. The French edition was followed by ſeveral others. One came out in Italian; another in the Dutch language; a fourth in the Daniſh: and laſtly, two in Engliſh, one of them in proſe and the other in verſe. Among the pieces which Mr Geſner publiſhed after the death of Abel was his Firſt Navigator, a poem in three cantos, which many people in Germany conſider as his maſterpiece. He made an attempt alſo in the paſtoral drama, but not with the ſame ſucceſs as in other kinds of rural poetry. He produced likewiſe, in the ſame ſtyle, Evander and Alcimne, in three acts; and Eraſtus, a ſmall piece of one act, which was repreſented with ſome applauſe in ſeveral ſocieties, both at Leipſic and Vienna.

But though poetry was Geſner's darling purſuit, and though he enriched the literature of his country with works which will render his name immortal, he did not confine himſelf to one manner of imitating nature; he in turns took up the pencil and the pen, and his active genius equally directed them both. In his infancy he had received a few leſſons in drawing, and he had afterwards purſued his ſtudy, but without any intention of becoming an artiſt. At the age of thirty he felt that violent deſire, which may be conſidered as the voice of genius; and this was in ſome meaſure excited by the ſight of a beautiful collection formed by Mr Heidegger, whoſe daughter he had married. To pleaſe his father-in-law, he ſtudied this treaſure, compoſed principally of the beſt pieces of the Flemiſh ſchool; and to this new taſte he had almoſt ſacrificed every other, Mr Geſner at firſt ventured only to delineate ſome decorations for the frontiſpieces of curious books printed in his office; but by little and little he had the courage to make other attempts. In 1765, he publiſhed 10 landſcapes etched and engraved by himſelf, and dedicated them to his friend Mr Watlet. Mr Geſner owed him this mark of reſpect for the care which he took to ornament with beautiful vignettes Mr Huber's tranſlation of his Idylls. Twelve other pieces appeared in 1769; and after theſe attempts, Mr Geſner executed ornaments for many works which came from his preſſes, among which were his own works, a German tranſlation of Swift, and ſeveral others. Geſner.

Were we to judge from Mr Geſner's enthuſiaſm for his favourite purſuits, and from the time and attention which he beſtowed upon them, we ſhould be apt to conclude, that he found little leiſure for diſcharging his duty as a citizen. The contrary however, was the caſe, for he paſſed almoſt the half of his life in the firſt employments of the ſtate. In 1765 he was called to the grand council, in 1767 to the leſſer. In 1768 he was appointed bailiff of Elibach, that of the four guards in 1776, and in 1781 ſuperintendant of waters, which office in 1787 was continued to him for ſix years. In all theſe ſtations Mr Geſner diſcharged his duty with the moſt ſcrupulous fidelity; and died of a paralytical diſorder, lamented by his countrymen and by thoſe who had the pleaſure of his acquaintance, on the 2d of March 1788, at the age of 56.

As a paſtoral poet, Geſner undoubtedly is entitled to a very diſtinguiſhed rank: and we may juſtly ſay, that if he has been equalled by any, he has been excelled by none. It is commonly believed, that paſtoral poetry is very limited and confined; but thoſe who read the works of Geſner will be convinced, that it is ſuſceptible of much variety when treated of by the hand of a maſter. His paſtoral romance of Daphnis is not inferior in natural ſimplicity to the celebrated work of Longus; but it ſurpaſſes it far in variety of images and incident. Eraſtus and Evander are inſtructive and intereſting poems, on account of the contraſt between the world and nature which reigns throughout them; and his Firſt Navigator unites the mildeſt philoſophy to all the ſplendour and imagery of Fairy Land. If we analyze his dramatic poems, we ſhall find in them intereſting fictions, characters well delineated, and ſituations replete with novelty. His language is that of the Graces, and the chaſteſt ears might liſten to the love which he has created. If he has ſometimes the humour of Sterne and Fontaine, it is without their licentiouſneſs. The ſevereſt taſte can find in his writings, no lacuna to ſupply, no phraſe deſerving reprehenſion, nor could a more ingenious choice of expreſſions be ſubſtituted in the room of thoſe which he has adopted.—Geſner's character as a man, appears to be no leſs amiable. In whatever point of view we conſider him, whether as a huſband, a father, a friend, a magiſtrate, or a citizen, his virtues are equally conſpicuous. He was naturally of a melancholy turn, but he was no enemy to rational and well-timed mirth; while the mildneſs and affability of his temper rendered his company always engaging, and endeared him to thoſe who had the pleaſure of his acquaintance. Poſſeſſed of that nobleneſs of ſentiment, united with great modeſty, which is the uſual attendant of true genius, he was ſimple in his external appearance, as well as in his converſation. His language was lively and animated; but his reſerve before ſtrangers reſembled timidity,

and

Geſner || Gethin.

and it was only in the preſence of thoſe with whom he was acquainted, that his real character appeared in its full luſtre.

Mr Geſner's reputation and virtues were known even to the remoteſt parts of Europe. The empreſs of Ruſſia Catharine II. preſented him with a gold medal as a mark of her eſteem. Strangers of all nations gave him no leſs flattering teſtimonies of their admiration; and travellers thought they had ſeen only the half of Switzerland, if they had not been in the company of Geſner, or procured ſome of his landſcapes or drawings. In this laſt way he had acquired ſo much reputation, that he was ranked among the beſt artiſts of Germany; and Mr Fuſeli, his countryman, who was himſelf a painter, in the preface to the third volume of the new edition which he publiſhed of his 'Hiſtorical eſſay on the painters, engravers, architects, and ſculptors, who have done honour to Switzerland,' gives a diſtinguiſhed place to Mr Geſner, though then living.

GESNERIA, a genus of plants belonging to the didynamia claſs, and in the natural method ranking under the 40th order, *Perſonatæ*. See BOTANY *Index*.

GESSORIACUM, in *Ancient Geography*, a port and ſtation for ſhips of the Morini in Belgica. In Cæſar's time, according to Dio, there was no town; but Florus ſpeaks of it as one: and the Geſſoriacenſes Muri are mentioned by Eumenius in his panegyric. The author of Tabula Theodoſiana, commonly called *Peutinger's map*, ſays expreſsly, that Geſſoriacum was in his time called *Bononia*. Now *Boulogne* in Picardy. E. Long. 1. 30. N. Lat. 50. 40.

GESTATION, among phyſicians. See PREGNANCY.

GESTRICIA, a province of Sweden, bounded by Helſingia on the north, by the Bothnic gulf on the eaſt, by Upland on the ſouth, and by Dalecarlia on the weſt.

GESTURE, a motion of the body, intended to ſignify ſome idea or paſſion of the mind. It conſiſts prineipally in the action of the hands and face; and may be defined, a ſuitable conformity of the motions of the countenance, and of ſeveral parts of the body, in ſpeaking, to the ſubject matter of the diſcourſe. See DECLAMATION and ORATORY.

GETA, SEPTIMUS, a ſon of the emperor Severus, brother to Caracalla. In the eighth year of his age, he was moved with compaſſion at the fate of ſome of the partizans of Niger and Albinus who were to be executed, and his father ſtruck with his humanity retracted the ſentence. After Severus's death he reigned at Rome conjointly with his brother; but Caracalla, who envied his virtues and was jealous of his popularity, ordered him to be poiſoned; and when this could not be effected, he murdered him in the arms of his mother Julia, who in the attempt of defending the fatal blows from his body received a wound in her arm, from the hand of her ſon, A. D. 212. Geta had not yet reached the 23d year of his age, and the Romans had reaſon to lament the death of ſo virtuous a prinee, while they groaned under the cruelties and oppreſſion of Caracalla.

GETHIN, LADY GRACE, an Engliſh lady of uncommon parts, was the daughter of Sir George Norton of Abbots-Leigh in Somerſetſhire, and born in the year 1676. She had all the advantages of a liberal education; and became the wife of Sir Richard Gethin, of Gethin Grott in Ireland. She was miſtreſs of great accompliſhments, natural and acquired, but did not live long enough to diſplay them to the world; for ſhe died in the 21ſt year of her age. She was buried in Weſtminſter abbey, where a beautiful monument with an inſcription is erected over her; and, for perpetuating her memory, proviſion was made for a ſermon to be preached in Weſtminſter abbey yearly, on Aſh Wedneſday for ever. She wrote, and left behind her, in looſe papers, a work which, ſoon after her death, was methodized, and publiſhed under the title of "*Reliquiæ Gethinionæ*; or, Some remains of the moſt ingenious and excellent lady, Grace, lady Gethin, lately deceaſed. Being a collection of choice diſcourſes, pleaſant apophthegms, and witty ſentences. Written by her, for the moſt part, by way of eſſay, and at ſpare hours." Lond. 1700, 4to; with her picture before it.

Gethin || Ghent.

GETHSEMANE, in *Ancient Geography*, a village in the mount of Olives, whither Jeſus Chriſt ſometimes retreated in the night time. It was in a garden belonging to this village that he ſuffered the agony in which he ſweated drops of blood; and here he was arreſted by Judas and the reſt who were conducted by this traitor. The place is by Maundrel deſcribed as an even plot of ground, not above 57 yards ſquare, lying between the foot of Mount Olivet and the brook Cedron.

GETHYLLIS, a genus of plants belonging to the dodecandria claſs, and in the natural method ranking under the ninth order *Spathaceæ*. See BOTANY *Index*.

GEUM, AVENS, or *Herb Bennet*, a genus of plants belonging to the icoſandria claſs, and in the natural method ranking under the 35th order, *Senticoſæ*. See BOTANY *Index*.

GHENT, a city of the Auſtrian Netherlands, capital of the province of Flanders. It is ſeated on four navigable rivers, the Scheldt, the Lys, the Lieve, and the Moere, which run through it, and divide it into canals. Theſe form 26 little iſles, over which there are 300 bridges: among which there is one remarkable for a ſtatue of braſs of a young man, who was obliged to cut off his father's head; but as he was going to ſtrike, the blade flew into the air, and the hilt remained in his hand, upon which they were both pardoned. There is a picture of the whole tranſaction in the townhouſe. Ghent is ſurrounded with walls and other fortifications, and is tolerably ſtrong for a place of its circumference. But all the ground within the walls is not built upon. The ſtreets are large and well paved, the market places ſpacious, and the houſes built with brick. But the Friday's market place is the largeſt, and is remarkable for the ſtatue of Charles V. which ſtands upon a pedeſtal in the imperial habit. That of Cortere is remarkable for a fine walk under ſeveral rows of trees. In 1737 a fine opera houſe was built here, and a guard houſe for the garriſon. Near the town is a very high tower, with a handſome cloek and chimes. The great bell weighs 11,000 pounds.

This town is famous for the pacification ſigned here, in 1526, for ſettling the tranquillity of the Seventeen Provinces, which was afterwards confirmed by the king of Spain. It was taken by Louis XIV. in 1678, who

Ghent, Ghoſt.

who afterwards reſtored it. The French took poſſeſſion of it again after the death of Charles II. of Spain. In 1706, it was taken by the duke of Marlborough; and by the French in 1708; but it was retaken the ſame year. Laſt of all, the French took it by ſurpriſe after the battle of Fontenoy; but at the peace of Aix-la-Chapelle, it was rendered back. It was alſo taken by the French in 1794. This is the birth-place of John of Gaunt. It is very well ſeated for trade, on account of its rivers and canals. It carries on a great commerce in corn; and has linen, woollen, and ſilk manufactures. The number of inhabitants is about 70,000. E. Long. 3. 50. N. Lat. 51. 14.

GHOST, an apparition, or ſpirit of a perſon deceaſed.

The ancients ſuppoſed every man to be poſſeſſed of three different ghoſts, which after the diſſolution of the human body were differently diſpoſed of. Theſe three ghoſts were diſtinguiſhed by the names of *Manes*, *Spiritus*, *Umbra*. The *manes*, they fancied, went down into the infernal region; the *ſpiritus* aſcended to the ſkies; and the *umbra* hovered about the tomb, as being unwilling to quit its old connexions. Thus Dido (Virg. Æn. iv. 384.) threatens Æneas after death that ſhe will haunt him with her umbra, whilſt her manes rejoices in his torments below. This idea of a threefold ſoul is very clearly expreſſed in theſe lines, which have been attributed to Ovid.

Bis duo ſunt homini: MANES, CARO, SPIRITUS, UMBRA:
Quatuor iſta loci bis duo ſuſcipiunt.
Terra tegit CARNEM, *tumulum circumvolat* UMBRA,
Orcus habet MANES, SPIRITUS *aſtra petit.*

The moſt ſtriking outlines of the popular ſuperſtitions reſpecting ghoſts among us, are thus humorouſly collected by Captain Groſe in his Provincial Gloſſary: "A ghoſt is ſuppoſed to be the ſpirit of a perſon deceaſed, who is either commiſſioned to return for ſome ſpecial errand, ſuch as the diſcovery of a murder, to procure reſtitution of lands or money unjuſtly withheld from an orphan or widow—or, having committed ſome injuſtice whilſt living, cannot reſt till that is redreſſed. Sometimes the occaſion of ſpirits reviſiting this world, is to inform their heir in what ſecret place, or private drawer in an old trunk, they had hidden the title deeds of the eſtate; or where, in troubleſome times, they buried their money or plate. Some ghoſts of murdered perſons, whoſe bodies have been ſecretly buried, cannot be at eaſe till their bones have been taken up, and depoſited in conſecrated ground with all the rites of Chriſtian burial.

"Sometimes ghoſts appear in conſequence of an agreement made, whilſt living, with ſome particular friend, that he who firſt died ſhould appear to the ſurvivor.

"Glanvil tells us of the ghoſt of a perſon who had lived but a diſorderly kind of life, for which it was condemned to wander up and down the earth, in the company of evil ſpirits, till the day of judgment.

"In moſt of the relations of ghoſts, they are ſuppoſed to be mere aerial beings, without ſubſtance, and that they can paſs through walls and other ſolid bodies at pleaſure. A particular inſtance of this is given, in relation the 27th, in Glanvil's collection, where one David Hunter, neat-herd to the biſhop of Down and Connor was for a long time haunted by the apparition of an old woman, whom he was by a ſecret impulſe obliged to follow whenever ſhe appeared, which he ſays he did for a conſiderable time, even if in bed with his wife: and becauſe his wife could not hold him in his bed, ſhe would go too, and walk after him till day, though ſhe ſaw nothing; but his little dog was ſo well acquainted with the apparition, that he would follow it as well as his maſter. If a tree ſtood in her walk, he obſerved her always to go through it. Notwithſtanding this ſeeming immateriality, this very ghoſt was not without ſome ſubſtance; for, having performed her errand, ſhe deſired Hunter to lift her from the ground; in the doing of which, he ſays, ſhe felt juſt like a bag of feathers. We ſometimes alſo read of ghoſts ſtriking violent blows; and that, if not made way for, they overturn all impediments, like a furious whirlwind. Glanvil mentions an inſtance of this, in relation 17th, of a Dutch lieutenant who had the faculty of ſeeing ghoſts; and who being prevented making way for one which he mentioned to ſome friends as coming towards them, was, with his companions, violently thrown down, and ſorely bruiſed. We further learn, by relation 16th, that the hand of a ghoſt is 'as cold as a clod.'

Ghoſt.

"The uſual time at which ghoſts make their appearance is midnight, and ſeldom before it is dark: though ſome audacious ſpirits have been ſaid to appear even by day light: but of this there are few inſtances, and thoſe moſtly ghoſts who have been laid, perhaps in the Red ſea (of which more hereafter), and whoſe times of confinement were expired: theſe, like felons confined to the lighters, are ſaid to return more troubleſome and daring than before. No ghoſts can appear on Chriſtmas eve; this Shakeſpeare has put into the mouth of one of his characters in Hamlet.

"Ghoſts commonly appear in the ſame dreſs they uſually wore whilſt living, though they are ſometimes clothed all in white; but that is chiefly the churchyard ghoſts, who have no particular buſineſs, but ſeem to appear *pro bono publico*, or to ſcare drunken ruſtics from tumbling over their graves.

"I cannot learn that ghoſts carry tapers in their hands, as they are ſometimes depicted, though the room in which they appear, if without fire or candle, is frequently ſaid to be as light as day. Dragging chains is not the faſhion of Engliſh ghoſts; chains and black veſtments being chiefly the accoutrements of foreign ſpectres ſeen in arbitrary governments: dead or alive, Engliſh ſpirits are free. One inſtance, however, of an Engliſh ghoſt dreſſed in black is found in the celebrated ballad of William and Margaret, in the following lines:

And clay cold was her lily hand
That held her *ſable ſhroud.*

This, however, may be conſidered as a poetical licenſe, uſed, in all likelihood, for the ſake of the oppoſition of *lily* to *ſable*.

"If, during the time of an apparition, there is a lighted candle in the room, it will burn extremely blue: this is ſo univerſally acknowledged that many eminent philoſophers have buſied themſelves in accounting for it, without once doubting the truth of the fact. Dogs, too, have the faculty of ſeeing ſpirits, as is inſtanced in

Ghoſt. David Hunter's relation above quoted; but in that caſe they uſually ſhow ſigns of terror, by whining and creeping to their maſter for protection; and it is generally ſuppoſed that they often ſee things of this nature when their owner cannot; there being ſome perſons, particularly thoſe born on a Chriſtmas eve, who cannot ſee ſpirits.

"The coming of a ſpirit is announced ſome time before its appearance, by a variety of loud and dreadful noiſes; ſometimes rattling in the old hall like a coach and ſix, and rumbling up and down the ſtaircaſe like the trundling of bowls or cannon balls. At length the door flies open, and the ſpectre ſtalks ſlowly up to the bed's foot, and opening the curtains, looks ſtedfaſtly at the perſon in bed by whom it is ſeen; a ghoſt being very rarely viſible to more than one perſon, although there are ſeveral in company. It is here neceſſary to obſerve, that it has been univerſally found by experience, as well as affirmed by diverſe apparitions themſelves, that a ghoſt has not the power to ſpeak till it has been firſt ſpoken to; ſo that, notwithſtanding the urgency of the buſineſs on which it may come, every thing muſt ſtand ſtill till the perſon viſited can find ſufficient courage to ſpeak to it: an event that ſometimes does not take place for many years. It has not been found that female ghoſts are more loquacious than thoſe of the male ſex, both being equally reſtrained by this law.

"The mode of addreſſing a ghoſt is by commanding it, in the name of the Three Perſons of the Trinity, to tell you who it is, and what is its buſineſs; this it may be neceſſary to repeat three times; after which it will, in a low and hollow voice, declare its ſatisfaction at being ſpoken to, and deſire the party addreſſing it not to be afraid, for it will do him no harm. This being premiſed, it commonly enters into its narrative; which being completed, and its requeſt or commands given, with injunctions that they be immediately executed, it vaniſhes away, frequently in a flaſh of light; in which caſe, ſome ghoſts have been ſo conſiderate as to deſire the party to whom they appeared to ſhut their eyes: ſometimes its departure is attended with delightful muſic. During the narration of its buſineſs, a ghoſt muſt by no means be interrupted by queſtions of any kind; ſo doing is extremely dangerous: if any doubts ariſe, they muſt be ſtated after the ſpirit has done its tale. Queſtions reſpecting its ſtate, or the ſtate of any of their former acquaintance, are offenſive, and not often anſwered; ſpirits perhaps being reſtrained from divulging the ſecrets of their priſon houſe. Occaſionally ſpirits will even condeſcend to talk on common occurrences, as is inſtanced by Glanvil in the apparition of Major George Sydenham to Captain William Dyke, relation 10th, wherein the major reproved the captain for ſuffering a ſword he had given him to grow ruſty: ſaying, 'Captain, captain, this ſword did not uſe to be kept after this manner when it was mine.' This attention to the ſtate of arms, was a remnant of the major's profeſſional duty when living.

"It is ſomewhat remarkable that ghoſts do not go about their buſineſs like the perſons of this world. In caſes of murder, a ghoſt, inſtead of going to the next juſtice of the peace, and laying its information, or to the neareſt relation of the perſon murdered, appears to ſome poor labourer who knows none of the parties, draws the curtains of ſome decrepit nurſe or alms woman, or hovers about the place where his body is depoſited. The ſame circuitous mode is purſued with reſpect to redreſſing injured orphans or widows; when it ſeems as if the ſhorteſt and moſt certain way would be, to go to the perſon guilty of the injuſtice, and haunt him continually till he be terrified into a reſtitution. Nor is the pointing out loſt writings generally managed in a more ſummary way; the ghoſt commonly applying to a third perſon ignorant of the whole affair, and a ſtranger to all concerned. But it is preſumptuous to ſcrutinize too far into theſe matters: ghoſts have undoubtedly forms and cuſtoms peculiar to themſelves. Ghoſt.

"If, after the firſt appearance, the perſons employed neglect, or are prevented from, performing the meſſage or buſineſs committed to their management, the ghoſt appears continually to them, at firſt with a diſcontented, next an angry, and at length with a furious, countenance, threatening to tear them in pieces if the matter is not forthwith executed; ſometimes terrifying them, as in Glanvil's relation 26th, by appearing in many formidable ſhapes, and ſometimes even ſtriking them a violent blow. Of blows given by ghoſts there are many inſtances, and ſome wherein they have been followed with an incurable lameneſs.

"It ſhould have been obſerved, that ghoſts, in delivering their commiſſions, in order to enſure belief, communicate to the perſons employed ſome ſecret, known only to the parties concerned and themſelves, the relation of which always produces the effect intended. The buſineſs being completed, ghoſts appear with a cheerful countenance, ſaying they ſhall now be at reſt, and will never more diſturb any one; and, thanking their agents, by way of reward communicate to them ſomething relative to themſelves, which they will never reveal.

"Sometimes ghoſts appear, and diſturb a houſe, without deigning to give any reaſon for ſo doing: with theſe, the ſhorteſt and only way is to exorciſe, and eject them; or, as the vulgar term is, lay them. For this purpoſe there muſt be two or three clergymen, and the ceremony muſt be performed in Latin; a language that ſtrikes the moſt audacious ghoſt with terror. A ghoſt may be laid for any term leſs than 100 years, and in any place or body, full or empty; as, a ſolid oak—the pommel of a ſword—a barrel of beer, if a yeoman or ſimple gentleman—or a pipe of wine, if an eſquire or a juſtice. But of all places the moſt common, and what a ghoſt leaſt likes, is the Red ſea; it being related, in many inſtances, that ghoſts have moſt earneſtly beſought the exorciſts not to confine them in that place. It is nevertheleſs conſidered as an indiſputable fact, that there are an infinite number laid there, perhaps from its being a faſter priſon than any other nearer at hand; though neither hiſtory nor tradition gives us any inſtance of ghoſts eſcaping or returning from this kind of tranſportation before their time.

"Another ſpecies of human apparition may be here noticed, though it does not come under the ſtrict deſcription of a ghoſt. Theſe are the exact figures and reſemblances of perſons then living, often ſeen not only by their friends at a diſtance, but many times by themſelves;

Ghoſt ‖ Giant.

ſelves; of which there are ſeveral inſtances in Aubery's Miſcellanies; one of Sir Richard Napier, a phyſician of London, who being on the road from Bedfordſhire to viſit a friend in Berkſhire, ſaw at an inn his own apparition lying on his bed as a dead corpſe; he nevertheleſs went forward, and died in a ſhort time: another of Lady Diana Rich, daughter of the earl of Holland, who met her own apparition walking in a garden at Kenſington, and died a month after of the ſmallpox. Theſe apparitions are called *fetches;* in Cumberland, *ſwarths;* and in Scotland, *wraiths:* they moſt commonly appear to diſtant friends and relations, at the very inſtant preceding the death of the perſon whoſe figure they put on. Sometimes, as in the inſtances above mentioned, there is a greater interval between the appearance and death." For a philoſophical inquiry into the ſubject of apparitions in general, ſee the article SPECTRE.

GIAGH, in *Chronology*, a cycle of 12 years; in uſe among the Turks and Cathayans.

Each year of a giagh bears the name of ſome animal: the firſt that of a mouſe; the ſecond that of a bullock; the third of a lynx or leopard; the fourth of a hare; the fifth of a crocodile; the ſixth of a ſerpent; the ſeventh of a horſe; the eighth of a ſheep; the ninth of a monkey; the tenth of a hen; the eleventh of a dog; and the twelfth of a hog.

They alſo divide the day into 12 parts, which they call *giaghs*, and diſtinguiſh them by the name of ſome animals. Each giagh contains two of our hours, and is divided into eight kehs, as many as there are quarters in our hours.

GIALLOLINO, in *Natural Hiſtory*, a fine yellow pigment, much uſed under the name of NAPLES YELLOW.

GIANT, a perſon of extraordinary bulk and ſtature.

The romances of all ages have furniſhed us with ſo many extravagant accounts of giants of incredible bulk and ſtrength, that the exiſtence of ſuch people is now generally diſbelieved. It is commonly thought, that the ſtature of men hath been the ſame in all ages; and ſome have even pretended to *demonſtrate* the impoſſibility of the exiſtence of giants mathematically. Of theſe our countryman M'Laurin hath been the moſt explicit. "In general (ſays he) it will eaſily appear, that the efforts tending to deſtroy the coheſion of beams ariſing from their own gravity only, increaſe in the quadruplicate ratio of their lengths: but that the oppoſite efforts tending to preſerve their coheſion, increaſe only in the triplicate proportion of the ſame lengths. From which it follows, that the greater beams muſt be in greater danger of breaking than the leſſer ſimilar ones; and that though a leſſer beam may be firm and ſecure, yet a greater ſimilar one may be made ſo long, that it will neceſſarily break by its own weight. Hence Galileo juſtly concludes, that what appears very firm, and ſucceeds very well in models, may be very weak and infirm, or even fall to pieces by its own weight, when it comes to be executed in large dimenſions according to the model. From the ſame principle he argues, that there are neceſſary limits in the operations of nature and art, which they cannot ſurpaſs in magnitude. Were trees of a very enormous ſize, their branches would fall by their own weight. Large animals have not ſtrength in proportion to their ſize; and if there were any land animals much larger than thoſe we know, they could hardly move, and would be perpetually ſubject to the moſt dangerous accidents. As to the animals of the ſea, indeed the caſe is different; for the gravity of the water in a great manner ſuſtains thoſe animals; and in fact theſe are known ſometimes to be vaſtly larger than the greateſt land animals. Nor does it avail againſt this doctrine to tell us, that bones have ſometimes been found which were ſuppoſed to have belonged to giants of immenſe ſize; ſuch as the ſkeletons mentioned by Strabo and Pliny, the former of which was 60 cubits high, and the latter 46: for naturaliſts have concluded on juſt grounds, that in ſome caſes theſe bones had belonged to elephants; and that the larger ones were bones of whales, which had been brought to the places where they were found by the revolutions of nature that have happened in paſt times. Though it muſt be owned, that there appears no reaſon why there may not have been men who have exceeded by ſome feet in height the talleſt we have ſeen." Giant.

It will eaſily be ſeen, that arguments of this kind can never be concluſive; becauſe, along with an increaſe of ſtature in any animal, we muſt always ſuppoſe a proportional increaſe in the coheſion of the parts of its body. Large works ſometimes fail when conſtructed on the plan of models, becauſe the coheſion of the materials whereof the model is made, and of the large work, are the ſame; but a difference in this reſpect will produce a very remarkable difference in the ultimate reſult. Thus, ſuppoſe a model is made of firwood, the model may be ſtrong and firm enough; but a large work made alſo of fir, when executed according to the plan of the model, may be ſo weak that it will fall to pieces by its own weight. If, however, we make uſe of iron for the large work inſtead of fir, the whole will be ſufficiently ſtrong, even though made exactly according to the plan of the model. The like may be ſaid with regard to large and ſmall animals. If we could find an animal whoſe bones exceeded in hardneſs and ſtrength the bones of other animals as much as iron exceeds fir, ſuch an animal might be of a monſtrous ſize, and yet be exceedingly ſtrong. In like manner, if we ſuppoſe the fleſh and bones of a giant to be greatly ſuperior in hardneſs and ſtrength to the bones of other men, the great ſize of his body will be no objection at all to his ſtrength. The whole of the matter therefore concerning the exiſtence of giants muſt reſt on the credibility of the accounts we have from thoſe who pretend to have ſeen them, and not on any arguments drawn *à priori.*

In the Scripture we are told of *giants*, who were produced from the marriages of the *ſons of God* with the *daughters of men* †. This paſſage indeed has been differently interpreted, ſo as to render it doubtful whether the word tranſlated *giants* does there imply any extraordinary ſtature. In other parts of Scripture, however, giants, with their dimenſions, are mentioned in ſuch a manner that we cannot poſſibly doubt; as in the caſe of Og king of Baſhan, and Goliath. In a memoir read before the Academy of Sciences at Rouen, M. Le Cat gives the following account of giants that are ſaid to have exiſted in different ages.

† See *Antediluvians.*

"Profane hiſtorians have given ſeven feet of height

Giant. to Hercules their firſt hero; and in our days we have ſeen men eight feet high. The giant who was ſhown in Rouen in 1735, meaſured eight feet ſome inches. The emperor Maximian was of that ſize; Shenkius and Platerus, phyſicians of the laſt century, ſaw ſeveral of that ſtature; and Goropius ſaw a girl who was ten feet high.—The body of Oreſtes, according to the Greeks, was eleven feet and a half; the giant Galbara, brought from Arabia to Rome under Claudius Cæſar, was near ten feet; and the bones of Secondilla and Puſio, keepers of the gardens of Salluſt, were but ſix inches ſhorter. Funnam, a Scotſman, who lived in the time of Eugene II. king of Scotland, meaſured eleven feet and a half; and Jacob le Maire, in his voyage to the Straits of Magellan, reports, that on the 17th of December 1615, they found at Port Deſire ſeveral graves covered with ſtones; and having the curioſity to remove the ſtones, they diſcovered human ſkeletons of ten and eleven feet long. The chevalier Scory, in his voyage to the peak of Teneriffe, ſays, that they found in one of the ſepulchral caverns of that mountain the head of a Guanche which had 80 teeth, and that the body was not leſs than 15 feet long. The giant Ferragus, ſlain by Orlando nephew of Charlemagne, was 18 feet high. Rioland, a celebrated anatomiſt, who wrote in 1614, ſays, that ſome years before there was to be ſeen in the ſuburbs of St Germain the tomb of the giant Iſoret, who was 20 feet high. In Rouen, in 1509, in digging in the ditches near the Dominicans, they found a ſtone tomb containing a ſkeleton whoſe ſkull held a buſhel of corn, and whoſe ſhin bone reached up to the girdle of the talleſt man there, being about four feet long, and conſequently the body muſt have been 17 or 18 feet high. Upon the tomb was a plate of copper, whereon was engraved, "In this tomb lies the noble and puiſſant lord, the chevalier Ricon de Vallemont, and his bones." Platerus, a famous phyſician, declares, that he ſaw at Lucerne the true human bones of a ſubject which muſt have been at leaſt 19 feet high. Valence in Dauphiné boaſts of poſſeſſing the bones of the giant Bucart, tyrant of the Vivarais, who was ſlain with an arrow by the count de Cabillon his vaſſal. The Dominicans had a part of the ſhin bone, with the articulation of the knee, and his figure painted in freſco, with an inſcription, ſhowing that this giant was 22 feet and a half high, and that his bones were found in 1705, near the banks of the Morderi, a little river at the foot of the mountain of Cruſſol, upon which (tradition ſays) the giant dwelt.

"January 11, 1613, ſome maſons digging near the ruins of a caſtle in Dauphiné, in a field which (by tradition) had long been called the *giant's field*, at the depth of 18 feet diſcovered a brick tomb 30 feet long, 12 feet wide, and 8 feet high; on which was a gray ſtone, with the words *Theutobochus Rex* cut thereon. When the tomb was opened, they found a human ſkeleton entire, 25 feet and a half long, 10 feet wide acroſs the ſhoulders, and five feet deep from the breaſt bone to the back. His teeth were about the ſize each of an ox's foot, and his ſhin bone meaſured four feet.—Near Mazarino, in Sicily, in 1516, was found a giant 30 feet high; his head was the ſize of an hogſhead, and each of his teeth weighed five ounces. Near Palermo, in the valley of Mazara, in Sicily, a ſkeleton of a giant 30 feet long was found, in the year 1548; and another of 33 feet high, in 1550; and many curious perſons have preſerved ſeveral of theſe gigantic bones. Giant.

"The Athenians found near their city two famous ſkeletons, one of 34 and the other of 36 feet high.

"At Totu, in Bohemia, in 758, was found a ſkeleton, the head of which could ſcarce be encompaſſed by the arms of two men together, and whoſe legs, which they ſtill keep in the caſtle of that city, were 26 feet long. The ſkull of the giant found in Macedonia, September 1691, held 210 pounds of corn.

"The celebrated Sir Hans Sloane, who treated this matter very learnedly, does not doubt theſe facts; but thinks the bones were thoſe of elephants, whales, or other enormous animals.

"Elephants bones may be ſhown for thoſe of giants; but they can never impoſe on connoiſſeurs. Whales, which, by their immenſe bulk, are more proper to be ſubſtituted for the largeſt giants, have neither arms nor legs; and the head of that animal hath not the leaſt reſemblance to that of a man. If it be true, therefore, that a great number of the gigantic bones which we have mentioned have been ſeen by anatomiſts, and by them have been reputed real human bones, the exiſtence of giants is proved."

With regard to the credibility of all or any of theſe accounts, it is difficult to determine any thing. If, in any caſtle of Bohemia, the bones of a man's leg 26 feet in length are preſerved, we have indeed a deciſive proof of the exiſtence of a giant, in compariſon of whom moſt others would be but pigmies. Nor indeed could theſe bones be ſuppoſed to belong to an elephant: for an elephant itſelf would but be a dwarf in compariſon of ſuch an enormous monſter. But if theſe bones were really kept in any part of Bohemia, it ſeems ſtrange that they have not been frequently viſited, and particular deſcriptions of them given by the learned who have travelled into that country. It is certain, however, that there have been nations of men conſiderably exceeding the common ſtature. Thus, all the Roman hiſtorians inform us, that the Gauls and Germans exceeded the Italians in ſize; and it appears that the Italians in thoſe days were of much the ſame ſtature with the people of the preſent age. Among theſe northern nations, it is alſo probable, that there would be as great differences in ſtature as there are among the preſent race of men. If that can be allowed, we may eaſily believe that ſome of the barbarians might be called *giants*, without any great impropriety. Of this ſuperiority of ſize, indeed, the hiſtorian Florus gives a notable inſtance in Teutobochus, above mentioned, king of the Teutones: who being defeated and taken priſoner by Marius, was carried in triumph before him at Rome, when his head reached above the trophies that were carried in the ſame proceſſion.

But whether theſe accounts are credited or not, we are very certain, that the ſtature of the human body is by no means abſolutely fixed. We ourſelves are a kind of giants in compariſon of the Laplanders; nor are theſe the moſt diminutive people to be found upon the earth. The Abbé la Chappe, in his journey into Siberia in order to obſerve the laſt tranſit of Venus, paſſed through a village inhabited by people called *Wotiacks*,

Giants Causeway.

Wotiacks, neither men nor women of whom were above four feet high. The accounts of the Patagonians alſo, which cannot be entirely diſcredited, render it very probable, that ſomewhere in South America there is a race of people very conſiderably exceeding the common ſize of mankind, and conſequently that we cannot altogether diſcredit the relations of giants handed down to us by ancient authors; though what degree of credit we ought to give them is not eaſy to be determined. See PATAGONIA.

REBEL Giants, in ancient mythology, were the ſons of Cœlus and Terra. According to Heſiod, they ſprang from the blood of the wound which Cœlus received from his ſon Saturn, and Hyginus calls them ſons of Tartarus and Terra. They are repreſented as men of uncommon ſtature, with ſtrength proportioned to their gigantic ſize. Some of them, as Cottus, Briareus, and Gyges, had each 50 heads and 100 arms, and ſerpents inſtead of legs. They were of a terrible aſpect, their hair hung looſe about their ſhoulders, and their beard was ſuffered to grow unmoleſted. Pallene and its neighbourhood was the place of their reſidence. The defeat of the Titans, to whom they were nearly related, incenſed them againſt Jupiter, and they all conſpired to dethrone him. Accordingly they reared Mount Oſſa upon Pelion, and Olympus upon Oſſa; and from thence attacked the gods with huge rocks, ſome of which fell into the ſea and became iſlands, and others fell on the earth and formed mountains. Jupiter ſummoned a council of the gods; when being informed that it was neceſſary to obtain the aſſiſtance of ſome mortal, he by the advice of Pallas called up his ſon Hercules; and with the aid of this hero he exterminated the giants Enceladus, Polybotes, Alcyon, Porphyrion, the two ſons of Alœus, Ephialtes, Othus, Eurytus, Clytius, Tithyus, Pallas, Hippolitus, Agrius, Thoon, and Typhon; the laſt of whom it was more difficult to vanquiſh than all the others. Jupiter having thus gained a complete victory, caſt the rebels down to Tartarus, where they were to receive the full puniſhment of their enormous crimes: according to the accounts of ſome of the poets, he buried them alive under Mount Ætna and different iſlands.

GIANTS Cauſeway, a vaſt collection of baſaltic pillars in the county of Antrim, on the north coaſt of Ireland. See BASALTES.

The principal or grand cauſeway conſiſts of a moſt regular arrangement of many hundred thouſands of columns of a black kind of rock, very hard: almoſt all of them are of a pentagonal figure, but ſo cloſely and compactly ſituated on their ſides, though perfectly diſtinct from top to bottom, that ſcarce any thing can be introduced between them. The columns are of an unequal height and breadth; ſome of the higheſt, viſible above the ſurface of the ſtrand, and at the foot of the impending angular precipice, may be about 20 feet; they do not exceed this height, at leaſt none of the principal arrangement. How deep they are fixed in the ſtrand, was never yet diſcovered. This grand arrangement extends nearly 200 yards, viſible at low water; how far beyond is uncertain: from its declining appearance, however, at low water, it is probable it does not extend under water to a diſtance any thing equal to what is ſeen above. The breadth of the principal cauſeway, which runs out in one continued range of columns, is, in general, from 20 to 30 feet; at one place or two it may be nearly 40 for a few yards. In this account are excluded the broken and ſcattered pieces of the ſame kind of conſtruction, that are detached from the ſides of the grand cauſeway, as they do not appear to have ever been contiguous to the principal arrangement, though they have frequently been taken into the width: which has been the cauſe of ſuch wild and diſſimilar repreſentations of this cauſeway, which different accounts have exhibited. The higheſt part of this cauſeway is the narroweſt, at the very foot of the impending cliff from whence the whole projects, where, for four or five yards, it is not above ten or fifteen feet wide. The columns of this narrow part incline from a perpendicular a little to the weſtward, and form a ſlope on their tops, by the very unequal height of the columns on the two ſides, by which an aſcent is made at the foot of the cliff, from the head of one column to the next above, *gradatim*, to the top of the great cauſeway, which, at the diſtance of half a dozen yards from the cliff, obtains a perpendicular poſition, and lowering in its general height, widens to about 20 or between 20 and 30 feet, and for 100 yards nearly is always above water. The tops of the columns for this length being nearly of an equal height, they form a grand and ſingular parade, that may be eaſily walked on, rather inclining to the water's edge. But from high water mark, as it is perpetually waſhed by the beating ſurges on every return of the tide, the platform lowers conſiderably, and becomes more and more uneven, ſo as not to be walked on but with the greateſt care. At the diſtance of 150 yards from the cliff, it turns a little to the eaſt for 20 or 30 yards, and then ſinks into the ſea. The figure of theſe columns is almoſt unexceptionably pentagonal, or compoſed of five ſides; there are but very few of any other figure introduced: ſome few there are of three, four, and ſix ſides, but the generality of them are five-ſided, and the ſpectator muſt look very nicely to find any of a different conſtruction: yet what is very extraordinary, and particularly curious, there are not two columns in ten thouſand to be found, that either have their ſides equal among themſelves, or whoſe figures are alike. Nor is the compoſition of theſe columns or pillars leſs deſerving the attention of the curious ſpectator. They are not of one ſolid ſtone in an upright poſition; but compoſed of ſeveral ſhort lengths, curiouſly joined, not with flat ſurfaces, but articulated into each other like ball and ſocket, or like the joints in the vertebræ of ſome of the larger kind of fiſh, the one end at the joint having a cavity, into which the convex end of the oppoſite is exactly fitted. This is not viſible, but by diſjoining the two ſtones. The depth of the concavity or convexity is generally about three or four inches. And what is ſtill farther remarkable of the joint, the convexity, and the correſpondent concavity, is not conformed to the external angular figure of the column, but exactly round, and as large as the ſize or diameter of the column will admit; and conſequently as the angles of theſe columns are in general extremely unequal, the circular edges of the joint are ſeldom coincident with more than two or three ſides of the pentagon, and from the edge of the circular part of the joint to the exterior ſides and angles they are quite plain. It is

Giants Cauſeway.

ſtill

Giants Cauſeway.

ſtill farther very remarkable, likewiſe, that the articulations of thoſe joints are frequently inverted; in ſome the concavity is upwards, in others the reverſe. This occaſions that variety and mixture of concavities and convexities on the tops of the columns, which is obſervable throughout the platform of this cauſeway, yet without any diſcoverable deſign or regularity with reſpect to the number of either. The length alſo of theſe particular ſtones, from joint to joint, is various: in general, they are from 18 to 24 inches long; and, for the moſt part, longer toward the bottom of the columns than nearer the top, and the articulation of the joints ſomething deeper. The ſize or diameter likewiſe of the columns is as different as their length and figure; in general, they are from 15 to 20 inches in diameter. There are really no traces of uniformity or deſign diſcovered throughout the whole combination, except in the form of the joint, which is invariably by an articulation of the convex into the concave of the piece next above or below it; nor are there any traces of a finiſhing in any part, either in height, length, or breadth, of this curious cauſeway. If there is here and there a ſmooth top to any of the columns above water, there are others juſt by, of equal height, that are more or leſs convex or concave, which ſhow them to have been joined to pieces that have been waſhed, or by other means taken off. And undoubtedly theſe parts that are always above water have, from time to time, been made as even as might be; and the remaining ſurfaces of the joints muſt naturally have been worn ſmoother by the conſtant friction of weather and walking, than where the ſea, at every tide, is beating upon it and continually removing ſome of the upper ſtones and expoſing freſh joints. And farther, as theſe columns preſerve their diameters from top to bottom, in all the exterior ones, which have two or three ſides expoſed to view, the ſame may with reaſon be inferred of the interior columns whoſe tops only are viſible. Yet what is very extraordinary, and equally curious, in this phenomenon, is, that notwithſtanding the univerſal diſſimilitude of the columns, both as to their figure and diameter, and though perfectly diſtinct from top to bottom, yet is the whole arrangement ſo cloſely combined at all points, that hardly a knife can be introduced between them either on the ſides or angles.

The cliffs at a great diſtance from the cauſeway, eſpecially in the bay to the eaſtward, exhibit at many places the ſame kind of columns, figured and jointed in all reſpects like thoſe of the grand cauſeway: ſome of them are ſeen near to the top of the cliff, which in general, in theſe bays to the eaſt and weſt of the cauſeway, is near 300 feet in height; others again are ſeen about midway, and at different elevations from the ſtrand. A very conſiderable expoſure of them is ſeen in the very bottom of the bay to the eaſtward, near a hundred roods from the cauſeway, where the earth has evidently fallen away from them upon the ſtrand, and exhibits a moſt curious arrangement of many of theſe pentagonal columns, in a perpendicular poſition, ſupporting, in appearance, a cliff of different ſtrata of earth, clay, rock, &c. to the height of 150 feet or more, above. Some of theſe columns are between 30 and 40 feet high, from the top of the ſloping bank below them; and, being longeſt in the middle of the arrangement, ſhortening on either hand in view, they have obtained the appellation of *organs*, from a rude likeneſs in this particular to the exterior or frontal tubes of that inſtrument; and as there are few broken pieces on the ſtrand near it, it is probable that the outſide range of columns that now appears is really the original exterior line, to the ſeaward, of this collection. But how far they extend internally into the bowels of the incumbent cliff, is unknown. The very ſubſtance, indeed, of that part of the cliff which projects to a point, between the two bays on the eaſt and weſt of the cauſeway, ſeems compoſed of this kind of materials; for beſides the many pieces that are ſeen on the ſides of the cliff that circulate to the bottom of the bays, particularly the eaſtern ſide, there is, at the very point of the cliff, and juſt above the narrow and higheſt part of the cauſeway, a long collection of them ſeen, whoſe heads or tops juſt appearing without the ſloping bank, plainly ſhow them to be in an oblique poſition, and about half way between the perpendicular and horizontal. The heads of theſe, likewiſe, are of mixed ſurfaces, convex and concave, and the columns evidently appear to have been removed from their original upright, to their preſent inclining or oblique poſition, by the ſinking or falling of the cliff.

Giants Cauſeway || Gibbon.

GIBBET, or GIBET, a machine in manner of a gallows, whereon notorious criminals, after execution, are hung in irons or chains, as ſpectacles *in terrorem*. See GALLOWS.—The word in French, *gibet*, properly denotes what we call gallows: it is ſuppoſed to come originally from the Arabic *gibel*, "mount or elevation of ground;" by reaſon *gibets* are uſually placed on hills or eminences.

GIBBON, EDWARD, a hiſtorian of diſtinguiſhed eminence, was born at Putney in the year 1737. He was the ſon of a gentleman of fortune and family diſtinction, who ſat as a member in two ſeparate parliaments. Edward when a boy, was of ſuch an extremely delicate conſtitution that his life was frequently deſpaired of. When at the ſchool of Weſtminſter, his progreſs was often retarded by repeated ſhocks of bad health. After being for a long time under the management of the beſt medical practitioners, his conſtitution was radically changed for the better, which induced his father to place him in Magdalen college as a gentleman commoner, that he might be puſhed into manly acquiſitions. This was prior to the completing of his fifteenth year. Before this time his reading had been of ſuch a nature as to ſtore his mind with much valuable hiſtorical knowledge, although his grammatical and philoſophical knowledge at this time was not ſo extenſive as that of ſome others at the ſame period of life. He ſays of himſelf; I arrived at Oxford with a ſtock of erudition that might have puzzled a doctor, and a degree of ignorance of which a ſchool-boy would have been aſhamed. Under ſuch circumſtances he was but ill prepared to receive the benefits of an univerſity education, and this was no doubt the reaſon why he exclaimed ſo bitterly againſt the public and private inſtructions at Oxford.

He was fond of polemical divinity from his infancy, and during his leiſure moments he turned his attention, when farther advanced, to the celebrated controverſy between Papiſts and Proteſtants; and as he had not then acquired talents ſufficient to enable him to combat

error

Gibbon. error and defend the truth, he fell a victim to the ſophiſtry of the church of Rome. His father, with a view to reclaim him from the love of what he conſidered as the moſt deſtructive of all errors, ſent him to Lauſanne in Switzerland, and put him under the care of Mr Pavilliard, a clergyman of the Calviniſtic perſuaſion. This gentleman called his pupil Edward, "A little thin figure, with a large head, diſputing, and urging with the greateſt ability, all the beſt arguments that had ever been uſed in favour of Popery." The maſterly exertions of Mr Pavilliard, who had to deal with a young man of ſolid reaſon and matured reflection, accompliſhed the recantation of Mr Gibbon, and he received the ſacrament in the Proteſtant church on the 25th of December 1754. At Lauſanne, too, he made great progreſs in many branches of knowledge which he had hitherto neglected, and acquired a regular habit of ſtudy. He became maſter of the French and Latin languages, and was a profound logician. He gave full ſcope to the exerciſe of reading excellent authors, which was his ruling paſſion. He did not appear fond of mathematics, and therefore ſoon relinquiſhed the ſtudy of them. At Lauſanne he fell in love with a young lady, the daughter of a village clergyman; but he was fruſtrated in his hopes, and the lady became afterwards the wife of the celebrated Necker.

On his return home in April 1758, his father received him with every mark of tenderneſs and affection, and his mother-in-law found means to conciliate his good opinion and his confidence. It is a ſingular circumſtance that he ſhould have taken a captain's commiſſion in the army, a profeſſion, one would have imagined, for which he was very ill calculated. Indeed he ſoon evinced the truth of this, for his tent and quarters were frequently encumbered with the odd furniture of Greek and Latin authors. On the event of peace he reſigned his commiſſion, and paid a viſit to Paris in the year 1763, where he reſided a few months, and afterwards went to Lauſanne, where he remained about a year, in order to prepare for a journey into Italy, which he accompliſhed in 1765. He thus ſpeaks on the occaſion of his entering Rome: "After a ſleepleſs night, I trod, with a lofty ſtep, the ruins of the forum; each memorable ſpot, where Romulus ſtood, or Tully ſpoke, or Cæſar fell, was at once preſent to my eye; and ſeveral days of intoxication were loſt or enjoyed before I could deſcend to a cool and minute inveſtigation." On the 15th of October, he informs us, the idea of writing the decline and fall of Rome firſt came into his mind, when the bare-footed friars were ſinging veſpers in the temple of Jupiter.

In the year 1770 Mr Gibbon loſt his father, and ſucceeded to an eſtate which was very much involved; yet he conſidered his circumſtances as very well adapted to the great and extenſive work he had undertaken to accompliſh, which in his own opinion he had probably never finiſhed, if he had been either poorer or richer than he was. He had an extenſive circle of acquaintance in London, but the time neceſſarily devoted to their company, he made up by early riſing and intenſe application. In the year 1774 he was choſen member of parliament for the borough of Liſkeard, by the influence of Lord Elliot, which threatened to give his ſtudies a very ſerious interruption. He ſat eight years in the houſe of commons without having the courage ſo much as once to open his mouth, notwithſtanding he was ſuch an elegant writer. When the firſt volume of his "Decline and Fall of the Roman Empire," made its appearance in 1776, it met with a greater degree of applauſe than he expected; but by no praiſe was he ſo highly gratified as by that which the two great hiſtorians of Scotland, Hume and Robertſon, beſtowed upon him. For his two chapters which relate to the ſpread of Chriſtianity he met with many antagoniſts, to whom he made no reply but to a Mr Davis, which was conſidered as a maſterpiece. There can be no doubt that Gibbon was a real enemy to revelation in the diſguiſe of a believer, a conduct not ſo abominable as at firſt ſight may appear, ſo long as penal laws exiſt againſt an open declaration of opinion. Gibbon, Gibbous.

Soon after the publication of the firſt volume of his hiſtory, he paid another viſit to Paris, and did not appear to be in much haſte to complete his extenſive work. In 1781, however, the ſecond and third volumes of his hiſtory were given to the world; and although in the eſtimation of many competent judges they were inferior to the firſt, they ſtill were allowed to poſſeſs ſufficient merit to ſupport his reputation. Having loſt his ſeat for Liſkeard, the influence of miniſtry brought him in as repreſentative for Lymington, and on the diſſolution of Lord North's miniſtry, he loſt his office as one of the lords of trade, which was a ſerious diminution of his income. He again determined to viſit his favourite Lauſanne, where he completed the remaining volumes of his hiſtory; but when the revolutionary mania began to rage on the continent, he quitted Lauſanne, and ſought for an aſylum in England. He mortally hated innovations of every kind, whether neceſſary or not, as appears from the following exclamation: "I beg leave to ſubſcribe my aſſent to Mr Burke's creed on the revolution of France. I admire his eloquence, I approve his politics, I adore his chivalry, and can almoſt excuſe his reverence for church eſtabliſhments."

During his conſoling viſit to Lord Sheffield, who had met with a trying domeſtic loſs, his attention was called to the rapid progreſs of a diſtemper which had ſubſiſted for about 30 years. A mortification at laſt enſued, which terminated his exiſtence on the 16th of January 1794, in the 67th year of his age. Mr Gibbon gives himſelf a character which is perhaps pretty near the truth. "I am endowed with a cheerful temper, a moderate ſenſibility, and a natural diſpoſition to repoſe rather than to activity: ſome miſchievous appetites and habits have perhaps been corrected by philoſophy or time. The love of ſtudy ſupplies each day, each hour, with a perpetual ſource of independent and rational pleaſure." Mr Gibbon poſſeſſed the manners and ſentiments of a gentleman in an eminent degree; he was eaſy in ſociety, of which he was extremely fond, and beloved by all who had the pleaſure of intimately knowing him.

GIBBOUS, a term in *Medicine*, denoting any protuberance or convexity of the body, as a perſon hunched or hump-backed.

Infants are much more ſubject to gibboſity than adults, and it oftener proceeds from external than internal cauſes. A fall, blow, or the like, frequently thus diſtorts the tender bones of infants. When it proceeds from

Gibbous ‖ Gibeon.

from an internal cauſe, it is generally from a relaxation of the ligaments that ſuſtain the ſpine, or a caries of its vertebræ; though the ſpine may be inflected forward, and the vertebræ thrown out by a too ſtrong and repeated action of the abdominal muſcles. This, if not timely redreſſed, grows up and fixes as the bones harden, till in adults it is totally irretrievable: but when the diſorder is recent, and the perſon young, there are hopes of a cure. The common method is by a machine of paſteboard, wood, or ſteel, which is made to preſs principally on the gibbous part; and this by long wearing may ſet all right. The ſurgeons, however, have a different inſtrument, which they call a *croſs*, much more efficacious, though not quite ſo convenient in the wearing. By the uſe of this, the parts are always prevented from growing any worſe, and are often cured. During the application of theſe aſſiſtances, the parts ſhould be at times rubbed with Hungary water, ſpirit of lavender, or the like, and defended with a ſtrengthening plaſter.

GIBBOUS, in *Aſtronomy*, a term uſed in reference to the enlightened parts of the moon, whilſt ſhe is moving from the firſt quarter to the full, and from the full to the laſt quarter; for all that time the dark part appears horned or falcated; and the light one hunched out, convex, or gibbous.

GIBEAH, a city in the tribe of Benjamin, lying north of Jeruſalem about 20 or 30 furlongs, and built upon a hill, as its name imports.—This city gave birth to Saul, the firſt king of Iſrael, for which reaſon it is frequently called Gibeah of Saul, or Gibeah the native country of Saul.

GIBELINS, or GIBELLINS, a famous faction in Italy, oppoſite to another called the GUELPHS.

Thoſe two factions ravaged and laid waſte Italy for a long ſeries of years; ſo that the hiſtory of that country, for the ſpace of two centuries, is no more than a detail of their mutual violences and ſlaughters. The Gibelins ſtood for the emperor againſt the pope: but concerning their origin and the reaſon of their names we have but a very obſcure account. According to the generality of authors, they roſe about the year 1240, upon the emperor Frederick II.'s being excommunicated by Pope Gregory IX. Other writers maintain, that the two factions aroſe ten years before, though ſtill under the ſame pope and emperor. But the moſt probable opinion is that of Maimbourg, who ſays, that the two factions of Guelphs and Gibelins aroſe from a quarrel between two ancient and illuſtrious houſes on the confines of Germany, that of the Henries of Gibeling, and that of the Guelphs of Adorf.

GIBEON, a city ſeated on an eminence about 40 furlongs from Jeruſalem northward, and not far from the city of Gibeah. See GEBA.

This was the capital city of the Gibeonites, who took the advantage of Joſhua's oath, and of that which the elders of Iſrael likewiſe ſwore to them, upon an artificial repreſentation which they made of their belonging to a very remote country, and their deſire of making an alliance with the Hebrews. Joſhua (ix. 3. 4, *et ſeq.*) and the elders inconſiderately entered into a league with theſe people; but ſoon diſcovered their miſtake. Upon this ſending for the Gibeonites, they reproached them with their fraud; and without revoking the promiſe which they had made to them, of giving them their lives, they condemned them to carry wood and water to the tabernacle of the Lord, as ſlaves and captives taken in war; in which ſtate of ſervitude they remained till the ruin and entire diſperſion of the Jewiſh nation. Gibeon ‖ Gibraltar.

The Gibeonites were deſcended from the Hivites, the old inhabitants of that country, and poſſeſſed four cities, whereof Gibeon was the capital. The cities were Chephirath, Beeroth, Kirjathjearim, and Gibeon, Joſh. ix. 17. Theſe cities were afterwards given to the tribe of Benjamin, except Kirjathjearim, which fell to the tribe of Judah. The Gibeonites continued ever after ſubject to thoſe burdens which Joſhua had impoſed on them, and were very faithful to the Iſraelites.

GIBLETS, the offals or entrails of a gooſe; including the heart and liver, with the feet, gizzard, &c. The word is ſuppoſed to be formed of *goblets*, from the French *gobeau*, "mouthful."—Giblets make a conſiderable article in cookery: they boil giblets, ſtew giblets, make ragouts of giblets, giblet pies, &c.

GIBRALTAR, a famous promontory, or rather peninſula, of Spain, lying in N. Lat. 36. 6. W. Long. 5. 17. To the ancients it was known by the name of *Calpe*, and was alſo called one of the *Pillars of Hercules*; by the Arabians it is called *Gebel Tarek*, that is, "the mount of Tarek," from *Tarek*, the name of the Saracen general who conquered Spain in the beginning of the eighth century. The whole is an immenſe rock, riſing perpendicularly about 440 yards, meaſuring from north to ſouth about two Engliſh miles, but not above one in breadth from eaſt to weſt. The town lies along the bay on the weſt ſide of the mountain on a declivity; by which, generally ſpeaking, the rains paſs through it, and keep it clean. The old town was conſiderably larger than the new, which at preſent conſiſts of between 400 and 500 houſes. Many of the ſtreets are narrow and irregular: the buildings are of different materials; ſome of natural ſtone out of the quarries, ſome of a factitious or artificial ſtone, and a few of brick. The people are ſupplied with freſh proviſions chiefly from the coaſt of Barbary, with fruit, roots, and vegetables of all ſorts from thence, or from their own gardens. Beſides what is properly called the town, there are ſeveral ſpacious and commodious public edifices erected; ſuch as barracks for the ſoldiers, with apartments for their officers, magazines of different kinds, ſtorehouſes for proviſions, &c. The inhabitants, excluſive of the Britiſh ſubjects dependent on the garriſon, or who reſide there from other motives, conſiſt of ſome Spaniards, a few Portugueſe, a conſiderable number of Genoeſe, and about as many Jews; making in the whole, according to Dr Campbell, between two and three thouſand, without reckoning the garriſon; though ſome make them much fewer. This town may be ſaid to have two ports; the firſt lying to the north, and is proper only for ſmall veſſels; the other is very commodious for large veſſels, and has a fine ſtone quay. The bay is vety beautiful and capacious, being in breadth about five miles, and in length eight or nine, with ſeveral ſmall rivers running into it. It is very advantageous to the place. There is no ground to be found in the middle of it at 100 fathoms depth, ſo that a ſquadron may lie there in great ſafety; the breezes from it are very refreſhing; and it contributes likewiſe

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likewiſe to the ſubſiſtence of the inhabitants, by ſupplying them with plenty of fiſh.

The ſtrait of Gibraltar, through which the ocean paſſes into the Mediterranean, thereby dividing Europe from Africa, runs from weſt to eaſt about 13 leagues. In this ſtrait there are three remarkable promontories or capes on the Spaniſh ſide, and as many oppoſite to them on the Barbary ſide. The firſt of theſe, on the ſide of Spain, is Cape Trafalgar, oppoſite to which is Cape Spartal; and in the neighbourhood of this ſtood the fortreſs of Tangier, once in the poſſeſſion of the Britiſh. The next on the Spaniſh ſide is Tariffa; and oppoſite it lies Malabata, near the town of Alcaſſar, where the ſtraits are about five leagues broad. Laſtly, Gibraltar facing the mountain of Abyla, near the fortreſs and town of Ceuta, which make the eaſtern entry of the ſtraits.

1 Fortreſs firſt erected by the Saracens.

This important fortreſs ſeems to have been firſt particularly noticed as a place of conſequence in the year 712. At that time the general of the caliph Al Walid landed with an army of 12,000 men on the iſthmus between Mount Calpe and the continent; and that he might ſecure an intercourſe with Africa, ordered a caſtle to be built on the face of that hill. Part of the building ſtill remains; and, from an inſcription diſcovered above the principal gate, appears to have been finiſhed in 725. It continued in the poſſeſſion of the Saracens till the beginning of the 14th century, when it was recovered by Ferdinand king of Caſtile. In 1333, however, it was obliged to ſurrender to the ſon of the emperor of Fez, who came to the aſſiſtance of the Mooriſh king of Granada. An attempt was made upon in it 1349 by Alonſo king of Caſtile; but when the fortreſs had been reduced to the laſt extremity, a peſtilential fever broke out in the Spaniſh camp, which carried off the king himſelf, with great part of his army; after which the enterpriſe was abandoned.

2 Various revolutions.

The fortreſs continued in the poſſeſſion of the Saracen deſcendants of the prince of Fez until the year 1410, when it was taken poſſeſſion of by Joſeph III. king of Granada. A deſign of attacking it was formed by Henry de Guſman in 1435; but the enterpriſe having miſcarried through his imprudence, he was defeated and ſlain. However, it was at length taken after a gallant defence by his ſon John de Guſman in 1462; ſince which time it has remained in the hands of the Chriſtians. In 1540, it was ſurpriſed and pillaged by Piali Hamet, one of Barbaroſſa's corſairs; but the pirates having fallen in with ſome Sicilian galleys, were by them defeated, and all either killed or taken.

3 Its fortifications improved and ſtrengthened.

In the reign of Charles V. the fortifications of Gibraltar were modernized, and ſuch additions made as to render them almoſt impregnable. It was taken by the Engliſh, however, in the reign of Queen Anne, and ſince that time has remained in their poſſeſſion; and probably will always do ſo, unleſs ceded by treaty, as it appears altogether impoſſible to reduce it by any force of artillery, let it be ever ſo great. In the year 1704, in conſequence of the reſolution adopted by the court of Britain to aſſiſt the archduke Charles in his pretenſions to the Spaniſh crown, Sir George Rooke was ſent with a powerful fleet into the Mediterranean. His orders being limited, nothing of conſequence was done for ſome time, until at laſt at attempt on Gibraltar was reſolved upon; not ſo much on account of the importance of the conqueſt, as to prevent any reflections againſt the admiral for inactivity. On the 21ſt of July that year, 1800 troops were landed upon the iſthmus, under the command of the prince of Heſſe Darmſtadt; and on the refuſal of the governor to ſurrender, preparations were made for attacking the place. Early in the morning of the 23d, a cannonade was begun from the fleet, and kept up ſo briſkly, that in five or ſix hours the Spaniards were driven from many of their guns, eſpecially at the new mole head. The admiral perceiving, that, by gaining this part of the fortification, the reduction of the reſt would be facilitated, ordered out ſome armed boats to take poſſeſſion of it. On their approach the Spaniards ſprung a mine, which demoliſhed part of the works, killed two lieutenants and 40 private ſoldiers, wounding about 60 more. Notwithſtanding this diſaſter, the aſſailants kept poſſeſſion of the work, and took a ſmall baſtion, now the eight-gun battery, half way between the mole and the town. On this the governor thought proper to capitulate, and the prince of Heſſe took poſſeſſion of the gates on the 24th. The garriſon, conſiſting at moſt of 150 men, marched out with the honours of war; and the Spaniards who choſe to remain were allowed the ſame privileges they had enjoyed under the reign of Charles II. The works were found very ſtrong, and the place well provided with ammunition and military ſtores.

4 Taken by Sir George Rooke in 1704.

This conqueſt was atchieved with the loſs of about 60 killed and 216 wounded on the part of the Engliſh. The prince of Heſſe remained governor; and 18 men of war were left at Liſbon under the command of Sir John Leake, to ſuccour the garriſon if there ſhould be occaſion. The loſs of ſuch an important fortreſs, however, having alarmed both the courts of Madrid and Paris, orders were ſent to the Marquis de Villadarias, a Spaniſh grandee, to lay ſiege to it, in which he was to be aſſiſted by a naval force from Toulon. The prince immediately applied to Sir John Leake for aſſiſtance; but before the latter had time to comply with his requeſt, a French fleet arrived, and debarked ſix battalions to the aſſiſtance of the Spaniards; after which they proceeded to the weſtward, leaving only ſix frigates in the bay. The trenches were opened on the 11th of October, about which time Sir John arrived with 20 ſail of Engliſh and Dutch ſhips; but hearing that the French were about to attack him with a ſuperior force, he judged it proper to return and refit. Having very prudently left orders at Liſbon to make preparations for this purpoſe in his abſence, he was enabled to accompliſh this work with ſuch expedition, that on the 29th of the ſame month, he returned and ſurpriſed in the bay three frigates, a fire ſhip, two Engliſh prizes, a tartan, and a ſtore ſhip. After this exploit he landed ſome reinforcements, ſupplied the garriſon with ſix months proviſion and ammunition; at the ſame time detaching on ſhore a body of 500 ſailors to aſſiſt in repairing the breaches which had been made by the enemy's fire.

5 Beſieged the ſame year by the Marquis de Villadarias.

6 The garriſon ſupplied with reinforcements and proviſions by Sir John Leake.

Thus the Spaniards were diſappointed in their hopes of ſucceſs from an attack which had been projected that very night, and for which purpoſe 200 boats had been collected. Still, however, they did not deſpair;

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and ſuppoſing that the garriſon would be off their guard and ſecure on account of the vicinity of their fleet, they formed the raſh deſign of attempting to ſurpriſe the place, though the Britiſh admiral was ſtill before it. In this mad attempt 500 volunteers aſſociated, taking the ſacrament never to return unleſs they accompliſhed their purpoſe. They were conducted by a goat-herd to the ſouth ſide of the rock near the cave guard, at that time called *the paſs of lycuſt trees*. This they mounted, and lodged themſelves the firſt night in the cave of St Michael: the next they ſcaled Charles V.'s Wall; ſurpriſed and maſſacred the guard at Middle hill; where afterwards, by ropes and ladders, ſeveral hundreds of the party deſigned to ſupport them were hauled up: but being diſcovered, they were attacked by a ſtrong party of grenadiers, and all of them at laſt either killed or taken. Theſe brave adventurers were to have been ſupported by a body of French troops, and ſome feints were propoſed to draw off the attention of the garriſon; but, through the diſagreement of the commanding officers, theſe propoſals were not put in execution, and thus the volunteers were left to their fate.

7 Deſperate attempt of ſome Spaniſh volunteers.

8 They are all killed or taken.

Notwithſtanding theſe misfortunes, the Spaniards ſtill continued the ſiege, and fitted out a ſtrong ſquadron from Cadiz, with a deſign to intercept the convoys of proviſions which might be ſent to the garriſon; flattering themſelves at the ſame time, that, on the arrival of their fleet, Sir John would be obliged to retire, and the garriſon of conſequence to ſurrender to their united attacks. They continued their fire therefore with additional fury, diſmounted many of the cannon, and did eſſential injury to the works in ſeveral different places. The prince of Heſſe, however, was by no means deficient in his endeavours to diſappoint their expectations. As it was probable that an attempt might be made to ſtorm the curtain, a cuvette was dug in the ditch, which was filled by the tide, and a double row of paliſades placed parallel to the works. The chambers of the mine under the glacis were loaded, and all means taken to defeat ſuch an attempt; but on a ſudden the Spaniards ſeemed to have altered their deſign, and threatened an attack on the lines which the garriſon had on the declivity of the hill to flank the glacis, and overlook their advanced works. While affairs remained in this ſituation, part of the ſuccours they had long expected arrived in the bay, December 7. 1704, and in two days after, the remainder came in with near 2000 men, along with a proportionable quantity of ammunition and proviſions. Theſe had ſailed from Cape Spartel under convoy of four frigates; but were in imminent danger of falling into the hands of the enemy, whoſe fleet they miſtook for their own; however they eſcaped by the fortunate circumſtance of being becalmed, ſo that they could not get up to them.

9 The ſiege ſtill continued.

10 The garriſon reinforced.

Sir John Leake having thus powerfully reinforced the garriſon, thought his preſence in the bay no longer neceſſary, and therefore ſet ſail for Liſbon, where he arrived about the end of the year. In the beginning of January 1705 the Spaniards were reinforced by a conſiderable body of infantry, and on the 11th of the month made an attack on the extremity of the King's Lines, but were repulſed. The attack was renewed next day with 600 grenadiers, French and Walloons, ſupported by 1000 Spaniards, under Lieutenant General Fuy. They diſpoſed themſelves in ſuch a manner as ſhowed an intention to ſtorm a breach which had been made in the Round Tower at the extremity of the King's Lines, and another in the intrenchment on the hill. The retrenchment which covered the latter breach, with part of the intrenchment joining the precipice of the rock, was defended at night by a captain, three ſubalterns, and 90 men; but it was cuſtomary for the captain to withdraw, with two ſubalterns and 60 men at daybreak. The Round Tower was defended by 180 men, commanded by a lieutenant-colonel. The marquis, by deſerters from the garriſon, had obtained intelligence of the ſtrength of theſe poſts, and planned his attack accordingly. The detachment for the upper breach mounted the rock at midnight, and concealed themſelves in the clifts until the captain had withdrawn; after which, advancing to the point of the intrenchment, they threw grenades on the ſubaltern and his party, ſo that they were obliged to leave the place. At the ſame time 300 men ſtormed the Round Tower, where Lieutenant Colonel Bar made a vigorous defence, though the enemy, having paſſed the breach above, annoyed them on the flanks with great ſtones and grenades. Obſerving, however, the Spaniards marching down to cut off his retreat from the town, he retired; and, by getting over the parapet of the King's Lines, deſcended into the covered way, where the Engliſh guards were poſted. Thus the garriſon were alarmed; all the regiments were aſſembled at their proper poſts; and Captain Fiſher endeavoured to ſtop the progreſs of the enemy with 17 men, but they were repulſed, and himſelf taken priſoner. At laſt, however, the Tower was retaken by Lieutenant Colonel Moncal at the head of 400 or 500 men, after it had been in the poſſeſſion of the enemy upwards of an hour.

11 Vigorous attack by the Spaniards.

12 They are repulſed.

The garriſon was now farther reinforced by ſix companies of Dutch troops and 200 Engliſh ſoldiers, together with ſome proviſions and ſtores. The aſſailants, however, were ſtill determined to go on. The marquis de Villadarias was ſuperſeded by Mariſchal Teſſe, a Frenchman, with whom Admiral Pointis was deſired to co-operate in blocking up the place. The mariſchal therefore joined the army with four freſh battalions, beſides eight companies which had been ſent before; the ordnance, which had been greatly injured by conſtant uſe, was exchanged for others, and the works as they then ſtood, put into the beſt repair. On the part of the Engliſh, a reinforcement was ordered under the command of Sir Thomas Dilkes and Sir John Hardy, to join Admiral Leake at Liſbon: which junction being effected, the whole fleet, conſiſting of 28 Engliſh, 4 Dutch, and 8 Portugueſe men of war, having on board two battalions of land forces, ſet ſail from Liſbon. Happily for the beſieged, however, the inceſſant rains and ſtorms about this time had retarded the operations of the land forces, and greatly diſtreſſed the fleet of the enemy. Eight ſhips of the latter were forced from their anchors by the ſtrong weſterly wind, and obliged to drive aloft. At this critical period Sir John Leake, with the allied fleet, entered the ſtraits. On his approach the few remaining French ſhips put out to ſea; and the Britiſh admiral diſcovering five ſail making out of the bay, and a gun fired at them from the garriſon,

13 The ſiege carried on with freſh ardour.

14 The French fleet diſperſed by a ſtorm.

Gibraltar. garriſon, immediately gave chaſe. Three French men of war were taken, and the admiral's ſhip and another driven on ſhore, where they were burnt. The reſt, on hearing the report of the guns, had made the beſt of their way to Toulon.

15 The ſiege turned into a blockade, and at laſt raiſed.

The garriſon was now ſo well ſupplied, that Mariſchal Teſſe withdrew his troops from the trenches, and formed a blockade, drawing an intrenchment acroſs the iſthmus to prevent the garriſon from ravaging the country. The prince of Heſſe remained for ſome time in the place, where he repaired the batteries, and made ſome additions to the fortifications; after which he joined the archduke Charles at Liſbon. As the latter, however, was reſolved to try his fortune with the earl of Peterborough in Valencia and Catalonia, the prince was ſent back to Gibraltar to prepare part of the garriſon for embarkation, and ſoon after was followed by the whole fleet. Major General Ramos was now appointed governor of Gibraltar, in which only two new battalions were left, as nothing was to be feared from the enemy. The new governor, however, brought with him 400 men for the greater ſecurity of the place; but ſoon reſigned his government to Colonel Roger Elliot, during whoſe time Gibraltar was made a free port by a ſpecial order from the queen.

Colonel Elliot was ſucceeded by Colonel Congreve before the year 1714, and he by Colonel Cotton a ſhort time after. In 1720 the Spaniards ſeem to have

16 A new attack threatened by the Spaniards in 1720.

threatened another attack. Ceuta, a Spaniſh fortreſs in Barbary, had been for many years beſieged by the Moors; and a powerful armament, commanded by the marquis de Lada, was now aſſembled in Gibraltar bay, under pretence of relieving the African fortreſs, but with a ſecret deſign of firſt ſurpriſing Gibraltar; for which purpoſe they had provided ſcaling ladders, &c. The armament, however, had not been fitted out with ſuch ſecrecy, but that the Britiſh miniſtry had intelligence of it. On this they ſent orders to Colonel Kane, governor of Minorca, to embark with part of his garriſon for Gibraltar under convoy of the fleet in the Mediteranean. On his arrival he found the place in a critical ſituation. The garriſon conſiſted only of three weak battalions under Major Hetherington, beſides whom there was only one other field officer, Major Batteroux, in the place, and no more than 14 days proviſions remaining. The poſture of affairs, however, was altered by the arrival of Colonel Kane with 500 men, with proviſions and ammunition; which reinforcement, together with the ſpirited behaviour of the

17 The deſign given up.

Britiſh commodore, induced the Spaniſh commander to abandon his deſign, though he remained of opinion that the fortreſs might then have been carried by a general aſſault.

18 Another attempt in 1726.

Notwithſtanding this diſappointment, the Spaniards continued to keep a watchful eye over Gibraltar; and, in the latter end of the year 1726, aſſembled an army in the neighbourhood of Algeſiras, encamping, on the 20th of January following, on the plain below St Roch, and erecting a battery on the beach to protect their camp. Though Admiral Hopſon was then at anchor in the bay of Gibraltar, yet, as he had received no intelligence of the actual commencement of hoſtilities between Britain and Spain, he was obliged to allow the boats of the latter to paſs with proviſions, arms, and ammunition, between Algeſiras and the camp, at the ſame time that Colonel (afterwards Brigadier) Kane, who had been a ſecond time ſent from Minorca, lay under ſimilar embarraſſments. The operations of the Spaniards, however, ſeemed ſo evidently to tend towards an attack, that the governor thought proper to order ſuch of that nation as were in the town to leave it, and to forbid their galleys to anchor under his guns (A). Gibraltar.

The count de las Torres commanded the Spaniſh forces, amounting to near 20,000 men; and ſoon after forming his camp, he advanced within reach of the garriſon. The brigadier then deſired him to keep out of his reach, otherwiſe he ſhould do his utmoſt to force him; but to this the Spaniſh commander replied, that, as the garriſon could command no more than they had power to maintain, he ſhould obey his Catholic majeſty's orders, and encroach as far as poſſible. Hoſtilities, however, were not commenced until the 10th of February 1727, when the Spaniards, having brought materials for batteries to the old windmill on the neutral ground, it was determined in a council of war, that the Spaniſh general had commenced hoſtilities by encroaching ſo far on the liberties of the garriſon. Still, however, the governor ſent to the count to know the reaſon of breaking ground before the garriſon; but received for anſwer, that "he was in his maſter's territories, and was not anſwerable to any other perſon for his conduct." On this the governor opened the batteries of the Old Mole and thoſe of Willis upon the Spaniſh workmen: however, they perſiſted on carrying on their operations, and at night marched a party down to the Devil's Tower, where they immediately broke ground, and began a communication with their other works. The governor was now informed by ſome deſerters, that the enemy were forming a mine in a cave under Willis's Battery, with a deſign to blow it up: but the plot being thus happily diſcovered, a party was immediately ſtationed to cut off the communication. On the 22d of February the Spaniards opened on the garriſon with 17 pieces of cannon beſides mortars; and the day following Brigadier Kane left Gibraltar to ſend a reinforcement from Minorca. On the 3d of March the enemy opened a new battery of 22 guns, on the Old Mole, and on the 8th another of 15 guns, bearing alſo upon the ſame mole, the guns of which had annoyed the weſtern flank of their approaches.

All this time the garriſon had kept up a conſtant and well directed fire from the batteries which bore upon the works of the enemy; but the ordnance in general being old, were frequently burſting; by which they ſuffered more than from the fire of the beſiegers.

(A) At this time the fortifications of Gibraltar were conſiderably different from what they had been in 1705. Several works were erected on the heights above the lines called *Willis's Batteries*; the Prince's Lines were extended to the extremity of the rock, and an inundation was formed out of the moraſs in front of the grand battery.

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The latter were alſo greatly diſtreſſed by the fleet under Admiral Hopſon and Sir Charles Wager, who, ſince the beginning of the ſiege, had intercepted their homebound ſhips, and at the ſame time greatly benefited the garriſon, by bringing the prizes into the bay. Finding the Spaniards, however, obſtinately bent on their enterpriſe, they formed a deſign, on the 2d of April, to bombard Algeſiras, from whence the beſiegers were ſupplied with various articles of ammunition; but the fleet happening to be becalmed, the deſign was afterwards unaccountably abandoned; and on the arrival of a reinforcement from Minorca, they ſailed to the weſtward, leaving the garriſon to defend themſelves the beſt way they could.

The enemy continued to augment their batteries, and erect new ones, until they amounted at laſt to 60 cannon beſides mortars; and, on the 3d of May, the governor received intelligence that a general aſſault was intended; to repel which he took every proper precaution. The enemy, however, ſtill added to their approaches, and conſiderable reinforcements were received by both parties. Hoſtilities, however, ceaſed on the 12th, when news arrived that the preliminaries of a general peace were ſigned; from which time to the year 1779, no farther attempts were made on Gibraltar. In the courſe of theſe two ſieges the loſs of the Spaniards was very conſiderable; that of 1705 coſting them not leſs than 10,000 men, including thoſe who died of ſickneſs; and in that of 1727 their loſs was computed at near 3000, beſides caſualties, which could not be aſcertained. That of the garriſon amounted in 1705 to 400; and in 1727 to 300; a very ſmall number, conſidering that during the ſiege 70 cannon and 30 mortars burſt on the batteries.

19 Ceſſation of hoſtilities.

20 Great loſs of the Spaniards in their attempts.

21 Gibraltar blocked up in 1779.

The hoſtile manifeſto preſented by the Spaniſh ambaſſador to the court of London at the commencement of the American war, was ſoon followed by an interruption of communication betwixt Spain and the fortreſs of Gibraltar. No direct intention of attacking or diſtreſſing it, however, was manifeſted till the 16th of July, when the port was completely blocked up by a ſquadron of two 74 gun ſhips, ſeveral frigates, galleys, &c. Ten days after they began to form a camp on the plain below St Roch, three miles from the fortreſs. The garriſon at this time conſiſted of 5382 men, including officers, with a company of engineers and artificers; but the greateſt expectations were formed from the abilities and valour of General Elliot the governor. As ſoon as the breaking off the communication with Spain indicated approaching hoſtilities, the governor took every precaution that could be ſuggeſted by military wiſdom; but though informed of the rupture betwixt the two courts having actually taken place, and though he beheld the hoſtile operations of the enemy, no means were uſed to interrupt them till the 12th of September,

22 Hoſtilities commenced by the garriſon.

when the batteries of Green's Lodge, Willis, and Queen Charlotte, were opened for a few hours, with a view to diſturb the workmen.

From this time to the beginning of the year 1780 the enemy continued the blockade both by ſea and land, but without doing any damage to the works or garriſon, and it was not until the 12th of January that a ſingle perſon was wounded, This happened to be a woman, who, paſſing near one of the houſes, was ſlightly hurt by a ſhot from the enemy. In the mean

23 A woman firſt wounded in the fortreſs.

time, however, the uſual ſupplies of proviſions being cut off, the garriſon began to feel all the horrors of famine. All the neceſſaries of life were very ſcarce, and to be procured only at exorbitant prices. Veal, mutton, and beef, ſold from half a crown to four ſhillings per pound; freſh pork from two to three ſhillings; ſalted beef and pork fifteenpence; fowls eighteen ſhillings per couple; ducks a guinea; fire wood, five ſhillings per hundred weight; a pint of milk and water fifteenpence; a ſmall cabbage coſt five ſhillings, and a ſmall bunch of outer leaves fivepence; Iriſh butter half a crown per pound; candles as much; and eggs ſixpence each. As the rock, however, is almoſt ſurrounded by the ſea, it was natural to ſuppoſe, that in ſuch a ſcarcity of other proviſions great benefit would have been derived from the ocean; but the fiſhermen, being all foreigners, and under no regulation, took advantage of the preſent ſcarcity of proviſions in the garriſon to exact a moſt exorbitant price for the fiſh they ſupplied.

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24 Exceſſive dearneſs of proviſions.

Had matters remained long in this ſtate, it is plain that the fortreſs, however ſtrong, muſt have fallen into the hands of the enemy. They were, however, effectually relieved in conſequence of the victory gained by Admiral Rodney over the Spaniſh fleet commanded by Don Juan de Langara. The former had been furniſhed with a ſtrong ſquadron, in order to relieve this important fortreſs; with which having ſet ſail, he in a few days fell in with a Spaniſh fleet of 16 tranſports bound from Bilboa to Cadiz, and laden with proviſions and naval ſtores, convoyed by a man of war of 64 guns, four frigates, and two armed veſſels. Of theſe only a ſingle tranſport eſcaped, the reſt being all captured on the 8th of January 1780; and the loſs of them, at the ſame time that it promiſed to be very ſerviceable to the garriſon, was equally detrimental to the enemy, who were now in great want both of proviſions and materials for their ſhipping.

25 The Spaniſh fleet defeated and their admiral taken by Rodney.

This advantage was ſoon after followed by a much greater. On the 16th of the ſame month a Spaniſh ſquadron of 11 ſail of the line was diſcovered off Cape St Vincent; and the Britiſh admiral having taken the proper methods to come up with them as quickly as poſſible, an engagement took place about four in the afternoon. At this time the headmoſt ſhips of the Britiſh line cloſed in with the neareſt of the enemy, and in half an hour one of the Spaniards, mounting 70 guns, and having on board 600 men, blew up, and all on board periſhed. In two hours more another Spaniſh ſhip of the line was taken; notwithſtanding which the fight continued with great vigour till two in the morning, when the headmoſt ſhip of the enemy ſtruck to the Sandwich; after which the firing ceaſed. The weather throughout the night was ſo tempeſtuous that it was with the utmoſt difficulty the Britiſh could take poſſeſſion of thoſe ſhips which ſurrendered. Theſe were ſix in number, but two of them drove aſhore and were loſt, only four being brought ſafe into Gibraltar. Theſe were the admiral's ſhip of 80 guns and 700 men, with three others of 70 guns and 600 men. The engagement, however, happened ſo near the ſhore, and the Britiſh were ſo eager in ſecuring the lee gage to prevent the enemy's eſcape, that Admiral Rodney's ſhip, together with ſome of the largeſt in the fleet, were in great danger of running on the ſhoals of St Lucar;

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nor could they be got into deep water again without much labour and the exertion of great naval ſkill. It was the opinion of all who were preſent in the action, that had this engagement happened in the day time, or had the weather been leſs boiſterous, not one of the Spaniſh ſhips could have eſcaped; and even as it was, thoſe which got off were ſo eſſentially damaged as to be unfit for ſervice.

26 The garriſon relieved and reinforced.

The news of this important victory arrived at Gibraltar on the evening of the day after it was fought; and in two days more the garriſon was completely relieved by the arrival of the fleet and convoy, at the ſame time that they were farther reinforced by a regiment of Highlanders, conſiſting of 1051 men, officers included. An opportunity was alſo taken of ſending away with the fleet all the invalids and women in the garriſon; with whom they ſet ſail on the 10th of February, leaving in the bay only the Edgar and Panther ſhips of the line, with two frigates.

On the departure of the Britiſh fleet, the blockade was immediately reſumed; and notwithſtanding the ample ſupplies lately received, the garriſon ſoon began again to experience the inconveniency of wanting freſh proviſions. It had hitherto received theſe in abundance from the coaſt of Barbary; but an unaccountable alteration had now taken place, ſo that the friendſhip of the emperor of Morocco was transferred from Great Britain to Spain in a manner totally unprecedented. His partiality towards the latter was the more ſurpriſing, as Britain had given no provocation, and the enmity between Spain and Morocco ſeemed to be in a manner conſtitutional, and founded upon ſuch cauſes as could never ceaſe to operate. Thus, however, the garriſon became daily more and more diſtreſſed, from being obliged to make conſtant uſe of their ſalt proviſions, and even this with the ſtricteſt economy. The induſtry and reſolution of the Britiſh ſeamen and officers, indeed, ſometimes overcame all obſtacles, ſo that they found means to procure the neceſſary refreſhments; though in ſo doing they were certainly expoſed to the utmoſt danger from the enemy. At the ſame time the defence of the garriſon was ſo vigorous, that while it continued to be ſupplied even in this ſcanty manner, the Spaniards began to loſe all hope of reducing it; for which reaſon they formed a project of burning all the Britiſh ſhipping in the bay. The night appointed for putting this ſcheme in execution was the 6th of June 1780, when 10 fire-ſhips, favoured by an uncommon darkneſs, ſtood over from the Spaniſh to the Britiſh ſide of the bay. Their deſign was to ſet fire to the ſtorehouſes neareſt to the water ſide, as well as to the ſhipping there; but having been too precipitate in firing their ſhips, and being received alſo by a very heavy cannonade, the attempt was fruſtrated. On this occaſion the ſkill and intrepidity of the Britiſh ſeamen were eminently diſplayed. Having manned their boats, they grappled the fire-ſhips already in flames; and, notwithſtanding their dreadful appearance and the danger of their exploding, towed them clear of the veſſels under the walls and extinguiſhed them.

27 The garriſon again reduced to ſtraits.

28 Unſucceſsful attempts to burn the Britiſh ſhipping.

The failure of this project was a grievous diſappointment to Don Barcelo the Spaniſh admiral, who lay ready with his ſquadron to intercept the Britiſh veſſels that might attempt to eſcape; at the ſame time that the batteries on their lines were in readineſs to bombard the town, if the fire-ſhips had ſucceeded in cauſing any conflagration on ſhore. The failure of the preſent attempt, however, was ſoon followed by other diſaſters. As ſoon as they had, with great labour, puſhed forward their new works, and conſtructed new batteries, they were certainly deſtroyed by the beſieged; and their mortification on theſe occaſions was the greater, as it was uſual for the governor to allow them to complete their works before he commenced his deſtructive operations. Thus the labour of many days was often loſt in a few hours, and afterwards was to be reſumed with as little proſpect of ſucceſs as before. The garriſon was now conſiderably annoyed by the Spaniſh gun boats, to which indeed the ſhipping were equally expoſed with themſelves. Theſe were veſſels from 30 to 40 tons burden, conſtructed ſo that they lay low in the water, which rendered them difficult to be aimed at. They had 15 oars on a ſide, carried 40 or 50 men, with a 26 pounder on the prow; and, from the facility of managing them, two were deemed, in calm weather to be a match for a frigate of moderate ſize. All their efforts, however, could ſtill do no more than to reduce the garriſon to great ſtraits for want of proviſions; and to this dreadful inconvenience the Britiſh ſubmitted with the greateſt cheerfulneſs. From the time of Admiral Rodney's departure in the month of February 1780 to the month of October, almoſt the only proviſions in the garriſon were ſuch as tended to produce the ſcurvy; which accordingly raged in ſuch a manner, as to threaten the moſt fatal conſequences. An antidote, however, was happily procured by the capture of a Daniſh dogger from Malaga laden with lemons and oranges, which the governor immediately purchaſed for the uſe of the garriſon and diſtributed among them. "At this time (ſays Captain Drinkwater) the ſcurvy had made dreadful ravages in our hoſpitals, and more were daily confined: many however, unwilling to yield to its firſt attacks, perſevered in their duty to the more advanced ſtages. It was therefore not uncommon, at this period, to ſee men, who, ſome months before, were hale, and capable of enduring any fatigue, ſupporting themſelves to their poſts upon crutches, and even with that aſſiſtance ſcarcely able to move along. The moſt fatal conſequences in ſhort were to be apprehended to the garriſon from this terrible diſorder, when this Dane was happily directed to our relief." According to Mr Cairncroſs, an eminent ſurgeon, who was preſent during this ſiege, "the ſcurvy which now raged in Gibraltar, differed in no reſpect from that diſeaſe uſually contracted by ſailors in long ſea voyages; and of which the immediate cauſe ſeemed to be the ſubſiſting for a length of time upon ſalted proviſions only, without a ſufficient quantity of vegetables or other aceſcent foods. The circumſtances related in the voyage of that celebrated circumnavigator Lord Anſon of conſolidated fractures diſuniting, and the calloſity of the bone being perfectly diſſolved, occured frequently in our hoſpitals, and old ſores and wounds opened anew from the nature of the diſorder. Various antiſcorbutics were uſed without ſucceſs, ſuch as acid of vitriol, ſour crout, extract of malt, eſſence of ſpruce, &c.; but the only ſpecifics were freſh lemons and oranges given liberally; or, when they could not

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29 Spaniſh works deſtroyed.

30 The garriſon annoyed by the Spaniſh gun boats.

31 The ſcurvy rages in the garriſon.

32 Cairncroſs's account of it.

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be procured, the preſerved juice in ſuch quantities, from one to four ounces per day, as the patient could bear. Whilſt the lemons were found, from one to three were adminiſtered each day as circumſtances directed. The juice given to thoſe in the moſt malignant ſtate was ſometimes diluted with ſugar, wine, or ſpirits; but the convaleſcents took it without dilution. Women and children were equally affected; nor were the officers exempted from this dreadful diſorder. It became almoſt general at the commencement of the winter ſeaſon, owing to the cold and moiſture, and in the beginning of ſpring when vegetables were ſcarce.

33 Method of preſerving lemon juice.

The juice was preſerved by adding to 60 gallons of expreſſed liquor about five or ten gallons of brandy, which kept it in ſo wholeſome a ſtate, that ſeveral caſks were opened in good condition at the cloſe of the ſiege. The old juice, however, was not ſo ſpeedily efficacious as the fruit, though by perſevering longer in its uſe it ſeldom failed.

34 The garriſon diſtreſſed for want of proviſions.

Till this month the allowance of ſalt proviſions had continued undiminiſhed; but now it was judged neceſſary to reduce the allowance of bread and meat, and to make ſome other regulations in order to enforce the ſtricteſt economy with regard to food. Every thing of this kind that could be practiſed, however, ſeemed inſufficient to preſerve the garriſon from abſolute want. In the beginning of the year 1781, proviſions became exceedingly ſcarce, by reaſon of the almoſt total expenditure of what was contained in the public ſtores, and the vigilance of the enemy's cruiſers. About the middle of February the town bakers left off work for want of flour; and many of the poorer ſort wanted bread. The price of freſh proviſions again roſe to a moſt enormous height. Small pigs ſold at two guineas; turkeys at three; geeſe at 30 ſhillings; fowls and ducks at 10 ſhillings; damaged biſcuit a ſhilling the pound; peaſe 1s. 6d.; and all other neceſſaries in proportion; at the ſame time the ſcarcity of fuel was ſuch, that it was ſometimes ſcarcely procurable in quantity ſufficient to dreſs the victuals.

35 The garriſon entirely deprived of the uſe of the neutral ground.

The garriſon had hitherto derived aſſiſtance occaſionally from the gardens on the neutral ground, though vaſt quantities of vegetables had been removed thence by the enemy. Towards the end of the month of October 1780, however, the Spaniards determined to expel the Britiſh from the gardens entirely: and this they accompliſhed in ſpite of all that could be done to prevent them. From this time the reſources with regard to vegetables depended entirely upon the attention paid to cultivation; which, happily for the garriſon, was attended with ſuch ſucceſs, eſpecially during the winter months, that the produce came at laſt to be nearly equal to the demand.

36 Supplied by the Britiſh fleet.

At laſt, on the 12th of April 1781, ſupplies were brought by the Britiſh fleet under Admirals Darby, Digby, and Roſs, though they could not be got in without great difficulty. The gun boats already mentioned were now much increaſed in number and ſtrength of conſtruction; infeſting the bay in ſuch a manner as greatly to interrupt the debarkation of the ſtores. As no veſſels of the ſame kind had been prepared to oppoſe them, they could ſcarce be prevented from effecting their purpoſe of burning the ſtore ſhips. With this view they had approached them every morning in hazy weather to the number of between 20 and 30, ſeveral of them carrying mortar-pieces; and as they uſed both ſails and oars, they eluded all purſuit, by withdrawing on the riſe of any breeze. To keep off theſe troubleſome gueſts, ſeveral ſtout frigates were obliged to ſtation themſelves along the bay for the protection of the ſhipping; but even this did not prevent them from continuing their moleſtation; and notwithſtanding the vigilance and activity of the Britiſh ſailors, it was ſeldom that they could come near enough to do them any damage. In ſpite of all their endeavours, however, the garriſon was effectually relieved: an exploit which ſo exceedingly irritated the court of Spain, that they determined to exert the utmoſt force of the kingdom rather than fail in the execution of their favourite project. The works before the town were therefore carried on with more vigour than ever, and the moſt tremendous preparations made to cauſe the obſtinate garriſon feel the reſentment of an exaſperated enemy. Their batteries were now mounted with guns of the heavieſt metal, and with mortar-pieces of the largeſt ſize; the number of the former augmented to near 200, and of the latter to upwards of 80. For three weeks this prodigious artillery continued to pour forth an almoſt inceſſant ſhower of ſhot and ſhells, inſomuch that, in the time juſt mentioned, they had conſumed 100,000lb. of gunpowder, and thrown into the town four or five thouſand ſhot or ſhells every 24 hours.

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37 The Spaniards reſolve to exert themſelves to the utmoſt.

38 The town entirely deſtroyed.

By ſuch an immenſe bombardment the town was almoſt totally laid in ruins. The inhabitants, computed at more than 3000 in number, experienced every difficulty that could ariſe from the deſtruction of their habitations: ſeveral of them were killed, and all forced to leave the town, and take ſhelter under tents with what accommodation could be provided for them in ſuch ſcenes of horror and confuſion. Numbers took the opportunity of retiring with the fleet; while many that remained were now reduced from a ſtate of opulence to the greateſt diſtreſs. The conduct of Governor Elliot was very humane and compaſſionate to ſuch as were inclined to depart; allowing them a free paſſage to England, and ſupplying them with proviſions for the voyage.

During this bombardment, not only the greateſt part of the effects belonging to the inhabitants were deſtroyed, but the fortifications were in many places greatly injured; and the worſt was, that the remainder were deſtroyed by the ſoldiers, who had arrived at ſuch a pitch of licentiouſneſs, that they neither regarded nor would obey their officers. They were incited to this deſtructive ſcheme by the avarice of ſome of the inhabitants who had hoarded up and concealed a quantity of neceſſary articles, in order to procure an advanced price. They now, therefore, kept no bounds in diſſipation, waſte, and extravagance; a remarkable inſtance of which is given by Captain Drinkwater, in their roaſting a pig by a fire made of cinnamon. To put a ſtop to theſe atrocious proceedings, rigorous meaſures were of neceſſity adopted; and it was intimated, that any ſoldier convicted of being drunk or aſleep upon his poſt, or found marauding, ſhould be immediately executed. The loſs of human lives during this dreadful bombardment was leſs than could have been expected; but many remarkable circumſtances are taken notice

39 Diſorderly behaviour of the ſoldiers.

Gibraltar. notice of by Captain Drinkwater, ſome of which are related in the note (B).

By the beginning of June 1781, the enemy had relaxed conſiderably in their firing, ſeldom exceeding 600 ſhot in a day; and continued gradually to diminiſh this number ſo remarkably, that towards the end of Auguſt, they ſeldom fired in the day, and only diſcharged ſix or ſeven, and ſometimes not above three, ſhot in the night. The batteries at land, however, were ſucceeded by the gun-boats; which renewed their attacks every day, keeping the garriſon in continual alarm, and never failing to do more or leſs execution. To reſtrain them, therefore, a battery of guns capable of throwing their ſhot to a great diſtance was erected as near as poſſible to the enemy; and as it reached their very camp, it was determined to open it upon them as often as the gun boats made their attacks; which being ſoon perceived, they thought it prudent to deſiſt in ſome meaſure from that mode of hoſtility. They continued ſtill, however, to improve their works, and for this purpoſe employed the beſt engineers both of France and Spain; ſo that by the latter part of November 1781, they had brought them to ſuch a ſtate of perfection as filled both kingdoms with the moſt ſanguine expectations of ſucceſs. Governor Elliot, however, far from being diſmayed at theſe formidable bulwarks, ſuffered them to proceed without moleſtation to the end of their ſcheme, that he might as in a moment deſtroy the labour of ſo many months, and thus render the diſappointment the greater. In the night of the 27th of November, a choſen party of 2000 men was detached, in order to deſtroy the enemy's works and batteries; and their ſucceſs was equal to their moſt ſanguine expectations. They marched out in great order and ſilence about two o'clock in the morning, under the command of Brigadier General Roſs; after which they proceeded with the ſame circumſpection, but with the utmoſt celerity, to the enemy's works, which they ſtormed and overthrew with aſtoniſhing rapidity. The Spaniards were inſtantly thrown into confuſion, and fled on every ſide; the guns and mortars on the batteries were all ſpiked up; and

40 The works of the enemy brought to the utmoſt perfection.

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41 They are entirely deſtroyed.

(B) Two boys belonging to the artificer company were endowed with ſuch wonderful ſtrength of viſion, that they could ſee the ſhot of the enemy in the air almoſt as ſoon as it came from the mouth of the gun; and were therefore conſtantly placed upon ſome part of the works to give notice to the ſoldiers of the approaching danger. During the time of the hotteſt fire, however, the men were ſo habituated to the fall of ſhells and ſhot around them, that they contracted an inſenſibility of danger, and almoſt required to be cautioned by their officers to avoid the exploſion of a ſhell when lying with the fuſee burning at their feet. In conſequence of this inattention, they frequently neglected the advice of the boys above mentioned, and their neglect could not but be productive of fatal effects. An inſtance of this happened on the Princeſs Amelia's battery, where a ſhot thus diſregarded came through one of the capped embraſures, carried off one leg from each of three ſoldiers, and wounded a fourth in both. In other caſes, in which the perſons themſelves have obſerved the ſhot or ſhells coming towards them, they have been faſcinated by its appearance, and unable to move from the ſpot, as ſmall birds are ſaid to be by the rattleſnake. "This ſudden arreſt of the faculties (ſays our author) was nothing uncommon: ſeveral inſtances occurred to my own obſervation, where men, totally free, have had their ſenſes ſo engaged by a ſhell in its deſcent, that though ſenſible of their danger, even ſo far as to cry for aſſiſtance, they have been immoveably fixed to the place. But what is more remarkable, theſe men have ſo inſtantaneouſly recovered themſelves on its fall to the ground, as to remove to a place of ſafety before the ſhell burſt." In this manner Lieutenant Lowe of the 12th regiment was faſcinated by a ſhot which he ſaw coming, but had not power to remove from the place before it fell upon him and took off his leg.

Where theſe ſhells burſt they produced inſtant and certain deſtruction, mangling in the moſt dreadful manner. The following are ſome inſtances: A matroſs had the misfortune of breaking his thigh by ſome accident; and being a man of great ſpirit, could ſcarce bear the confinement neceſſary for its reunion. In conſequence of this he went abroad too ſoon, and thus unfortunately broke the bone a ſecond time. Being now confined to bed, a ſhell happened to fall into the room where he was, and, rebounding, lodged itſelf directly upon him. The convaleſcents and ſick inſtantly ſummoned all their ſtrength, and crawled out of the room, while the poor matroſs lay below the ſhell, kept down by its weight, and utterly unable to ſtir. In a few ſeconds it burſt, and took off both his legs, and ſcorched him in a dreadful manner. He ſurvived the exploſion, was ſenſible to the laſt moment, and died regretting that he had not been killed on the batteries. The caſe of a ſoldier of the 73d regiment ſhows, that even in the moſt dangerous caſes we ſhould never deſpair of recovery while life remains. This unfortunate man had been knocked down by the wind of a ſhell, which, inſtantly burſting, killed his companion, and mangled himſelf in a ſhocking manner. His ſkull was dreadfully fractured, his left arm broken in two places, one of his legs ſhattered, the ſkin and muſcles torn off from part of his right hand, the middle finger broken to pieces, and his whole body moſt ſeverely bruiſed and marked with gunpowder. He preſented ſo horrid an object to the ſurgeons, that they had not the leaſt hopes of ſaving his life, and were at a loſs what part to attend to firſt. He was that evening trepanned; a few days afterwards his leg was amputated, and other wounds and fractures were dreſſed. Being poſſeſſed of a moſt excellent conſtitution, nature performed wonders in his favour, and in 11 weeks his cure was completely effected. On the 18th of September a ſhell from the lines fell into a houſe where the town major, Captain Burke, with Majors Mercier and Vignoles of the 39th regiment were ſitting. It took off Major Burke's thigh; afterwards fell through the floor into the cellar: there it burſt, and forced the flooring with the unfortunate major up to the ceiling. When aſſiſtance came, they found him almoſt buried in the ruins of the room. He was inſtantly conveyed to the hoſpital, where he died ſoon after the wounded part had been amputated. Majors Mercier and Vignoles

Gibraltar. and the artillerymen, artificers, and ſailors, exerted themſelves ſo vigorouſly, that in the ſpace of an hour the magazines were blown up, the ſtorehouſes of arms, ammunition, and military implements of every kind, and all the works that had been conſtructed, were ſet on fire, and totally conſumed; the whole damage done on this occaſion being eſtimated at upwards of two millions ſterling.

For ſeveral days after this diſaſter the Spaniards continued inactive, without even making any attempt to extinguiſh their batteries, which ſtill continued in flames; but in the beginning of December, as if ſuddenly arouſed from their reverie, upwards of 1000 men were ſet to work in order to prepare a great number of faſcines, from whence it was concluded that they deſigned to repair their works. In this they proceeded with their uſual perſeverance and diligence; but as the former methods of attack had conſtantly failed, it was evident, that if the place could be reduced at all, it muſt be by ſome means hitherto unattempted; and for the reduction of this ſingle fortreſs, the Spaniſh monarch, after the conqueſt of Minorca, determined to employ the whole ſtrength of his empire.

42 Floating batteries invented by the chevalier D'Arcon.

Among the various projects formed at this time, that of the chevalier D'Arcon, a French engineer of diſtinction, proved the moſt acceptable to the court of Spain; and though the expence attending it was immenſe, this ſeemed in the preſent circumſtances to be but a matter of ſmall conſideration. His plan was to conſtruct ſuch floating batteries as might neither be liable to be ſunk nor ſet on fire. With this view their bottoms were made of the thickeſt timber, and their ſides of wood and cork long ſoaked in water, with a layer of wet ſand betwixt them. Their thickneſs was ſuch, that they were impenetrable to cannon ſhot; and to prevent the effects of red-hot balls, a number of pipes were contrived to carry water through every part of the veſſel, and pumps ſufficient to furniſh a conſtant ſupply for the purpoſe. The people at the batteries were ſheltered from the bombs by a rope-netting, made ſloping that they might roll off, and ſpread with wet ſkins to prevent fire. Ten of theſe batteries were conſtructed out of the hulls of large veſſels, ſome of 50 or 60 guns, cut down for that purpoſe, and carrying from 10 to 28 guns each, with about half as many in reſerve in caſe of accidents. Each gun was ſerved by 36 artillery men; and theſe floating batteries were to be ſeconded by 80 large boats carrying guns and mortars of heavy metal; a great number of ſhips of force and frigates, with ſome hundreds of ſmall craft, were to accompany them with troops, for the inſtant execution of what might be judged neceſſary. On this occaſion upwards of 1000 pieces of artillery, and 80,000 barrels of gunpowder were provided. A body of 12,000 of the beſt troops of France were now added to the Spaniſh army before the place; the body of engineers was the beſt that both kingdoms could produce; and numbers of volunteers, of the beſt families in both, attended the ſiege. Numbers of military gentlemen alſo came from every part of Europe to be witneſſes of what paſſed at this celebrated ſiege, which was now compared to the moſt famous recorded in hiſtory. The conducting of it was committed to the duke de Crillon, who had diſtinguiſhed himſelf by the conqueſt of Minorca. Two princes of the blood royal of France, the count of Artois brother to the king, and the duke of Bourbon his couſin, came to be witneſſes of this extraordinary enterpriſe. Theſe behaved with the greateſt politeneſs both to the governor and garriſon. The count of Artois tranſmitted a packet of letters for various individuals in the garriſon, which had been intercepted and carried to Madrid, and which he requeſted that he might be the means of conveying to thoſe for whom they were deſigned. Both he and the duke of Bourbon ſignified to General Elliot the high regard they had for his perſon and character; and the duke de Crillon himſelf took this opportunity of expreſſing the ſame ſentiments, and to entreat him to accept of ſome refreſhments. General Elliot returned a polite anſwer, but accepted of the preſent with reluctance, and requeſted him for the future not to confer any favours of that kind upon him.

43 Prodigious armament brought before the fortreſs.

Such a prodigious armament raiſed the confidence of the beſiegers ſo high, that they looked upon the conqueſt

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Vignoles had time to eſcape before the ſhell burſt; nevertheleſs they were ſlightly wounded by the ſplinters, as were a ſerjeant and his daughter, who happened to be in the cellar when the ſhell entered.

The following are related as inſtances of very extraordinary eſcapes from the deſtructive power of theſe engines, and which indeed it ſeems difficult to account for.—A corporal had the muzzle of his firelock cloſed, and the barrel twiſted like a French horn, by a ſhell, without any injury to his perſon. A ſhell happened to fall into a tent where two ſoldiers were aſleep, without awakening them by its fall. A ſerjeant in an adjacent tent heard it, and ran near 40 yards to a place of ſafety, when he recollected the ſituation of his comrades. Thinking the ſhell had fallen blind, he returned and awakened them; both immediately roſe, but continued by the place, debating on the narrow eſcape they had had, when the ſhell exploded, and forced them with great violence againſt a garden wall, but "miraculouſly" did no further miſchief than deſtroying every thing in the tent. On the new year's day of 1782, an officer of artillery obſerved a ſhell falling towards the place where he ſtood, and got behind a traverſe for protection. This he had ſcarcely done, when the ſhell fell into the traverſe, and inſtantly entangled him in the rubbiſh: one of the guards, named *Martin*, obſerving his diſtreſs, generouſly riſked his own life in defence of his officer, and ran to extricate him: but finding his own efforts ineffectual, called for aſſiſtance; when another of the guard joining him, they relieved the officer from his ſituation; and almoſt at the ſame inſtant the ſhell burſt, and levelled the traverſe with the ground. Martin was afterwards promoted, and rewarded by the governor; who at the ſame time told him, that "he ſhould equally have noticed him for attending to his comrade." A ſhell happening to fall into the room where Enſign Mackenzie of the 73d regiment was ſitting, carried away part of his chair, and fell into the room below, where it burſt, lifting him and the chair from the floor without further injury.

Gibraltar. conqueſt of the place as an abſolute certainty. They began to be impatient at the delays which aroſe in bringing matters to the utmoſt point of perfection; and the commander in chief was thought by far too modeſt, when he ſaid that the garriſon might hold out for a fortnight. "It appeared (ſays Captain Drinkwater) that they meant, previous to their final efforts, to ſtrike if poſſible a terror through their opponents, by diſplaying an armament more powerful than had probably ever been brought before any fortreſs. Forty-ſeven ſail of the line, including three inferior two-deckers; ten battering ſhips, deemed perfect in deſign, and eſteemed invincible, carrying 212 guns; innumerable frigates, xebeques, bomb ketches, cutters, gun and mortar boats, and ſmaller craft for diſembarking men, were aſſembled in the bay. On the land ſide were moſt ſtupendous and ſtrong batteries and works, mounting 200 pieces of heavy ordnance, and protected by an army of near 40,000 men, commanded by a victorious and active general, and animated by the immediate preſence of two princes of the blood royal of France, with other dignified perſonages, and many of their own nobility. In their certainty of ſucceſs, however, the enemy ſeemed entirely to have overlooked the nature of that force which was oppoſed to them; for though the garriſon ſcarcely conſiſted of more than 7000 effective men, including the marine brigade, they forgot that they were now veterans in this ſervice, had long been habituated to the effects of artillery, and were by degrees prepared for the arduous conflict that awaited them. We were at the ſame time commanded by officers of approved courage, prudence, and activity; eminent for all the accompliſhments of their profeſſion, and in whom we had unbounded confidence. Our ſpirits too were not a little elevated by the ſucceſs attending the firing of red-hot ſhot (c), which in this attack we hoped would enable us to bring our labours to a concluſion, and relieve us from the tedious cruelty of a vexatious blockade."

As a prelude to the dreadful ſtorm which was about to be poured forth on this devoted garriſon, the enemy, on the 9th of September 1782, opened a battery of 64 of their largeſt cannon, which was ſhortly accompanied with a terrible fire from other batteries, and a great number of mortars. On this and the following day an attack was made upon the batteries erected on Europa Point (ſo called from being the moſt ſouthern point of the continent of Europe), which at that time were entirely under the management of Captain Curtis of the Brilliant frigate, who had diſtinguiſhed himſelf during the ſiege, and now commanded a brigade of ſeamen by whom the batteries were ſerved. By theſe the fire of the Spaniards was ſo warmly returned, that they not only could make no impreſſion, but were forced to retire, after having received ſo much damage, that two of their principal ſhips were obliged to withdraw to the bay of Algeſiras oppoſite to Gibraltar, in order to refit. On the 12th the enemy made preparations for the enſuing day, which was allotted for their grand and deciſive attack. Accordingly, on the morning of the 13th, the ten floating batteries came forward, under the command of Don Buenventura de Moreno, a Spaniſh officer of great gallantry, and who had ſignalized himſelf at the taking of Minorca. Before ten o'clock they had all got into their proper ſtations, anchoring in a line about a thouſand yards diſtant from the ſhore. As ſoon as they were properly arranged, they began a heavy cannonade, and were ſeconded by all the cannon and mortars in the enemy's lines and approaches, at the ſame time that the garriſon opened all its batteries both with hot and cold ſhot from the guns, and ſhells from the howitzers and mortars. This terrible fire continued on both ſides without intermiſſion until noon; when that of the Spaniards began to ſlacken, and the fire of the garriſon to obtain a ſuperiority. About two o'clock the principal battering ſhip commanded by Don Moreno was obſerved to emit ſmoke as if on fire, and ſome men were ſeen buſy upon the roof ſearching from whence it proceeded. The fire from the garriſon was now kept up without the leaſt diſcontinuance or diminution, while that from the floating batteries was perceived ſenſibly to decreaſe; ſo that about ſeven in the evening they fired but few guns, and that only at intervals. At midnight the admiral's ſhip was plainly ſeen to burn, and in an hour after was completely in flames. Eight more of theſe batteries took fire ſucceſſively; and on the ſignals of diſtreſs made by them, the multitude of feluccas, launches, and boats, with which they were ſurrounded, all came to their aſſiſtance, and began to take the men out of the burning veſſels. Captain Curtis, who lay ready with the gunboats to take advantage of any favourable circumſtance, came upon them at two in the morning, and forming a line on the enemy's flank, advanced upon them with ſuch order and expedition as to throw them into immediate confuſion. At this ſudden and unexpected attack they were ſo aſtoniſhed and diſconcerted, that they fled precipitately with all their boats, totally abandoning the floating batteries to be burnt, and all who were in them to periſh in the flames. This would undoubtedly have been their fate, had not Captain Curtis extricated them from the fire at the imminent danger of his own life and that of his men. In this work he was ſo eager, that while his boat was alongſide of one of the largeſt batteries, it blew up, and the fragments of the wreck ſpreading all around to a vaſt diſtance, ſome heavy pieces of timber fell into his boat and pierced through its bottom, killing one man and wounding ſeveral others. He eſcaped with difficulty out of this boat, which was ſunk, as well as another, by the ſame accident. The floating batteries were every one conſumed; and the violence with which they exploded was ſuch that doors and windows at a great diſtance on ſhore were burſt open. About 400 people were ſaved from them; many of whom were picked up floating on rafts and pieces of timber. Indeed the blowing up of the

Gibraltar.

44 Deciſive attack on the 13th of September 1782.

45 Terrible deſtruction of the Spaniards.

(c) This was ſuggeſted by Lieutenant Governor Boyd, and had been attended with remarkable ſucceſs, September 8th, when the enemy's advanced works were almoſt deſtroyed by it.

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the batteries as the flames reached their powder rooms, and the diſcharge of the guns in ſucceſſion as the metal became heated by the fire, rendered any attempt to ſave them very dangerous.

46 Inactivity of the combined fleet.

This terrible cataſtrophe took place in ſight of the combined fleets of France and Spain. It had been propoſed that they ſhould co-operate upon this important occaſion, by attacking the garriſon at Europa Point, and ſuch places as appeared moſt expoſed to an attempt by ſea. This, it was afterwards ſaid, muſt have occaſioned a material diverſion of the garriſon's force, and, by dividing it, have weakened conſiderably the vigorous means of defence uſed in thoſe parts which were actually attacked. The reaſon aſſigned for this inactivity was the want of wind.

47 The blockade continued.

Though this terrible repulſe effectually convinced the Spaniards that Gibraltar could not be taken by force, ſome hope ſtill remained, that, without any further exertions on their part, the garriſon would be obliged to ſurrender from want of ammunition and proviſions. With this view they continued to blockade it cloſely, and to cut off all communication, flattering themſelves that Britain would not be able to collect a naval force ſufficient to drive their fleet from the bay before the fortreſs was reduced to extremity; and this they imagined muſt be the caſe in a few days. Such diligence, however, had been uſed on the part of the Britiſh, that a fleet was already aſſembled at Portſmouth, conſiſting of 35 ſail of the line, in excellent condition, and filled with the beſt officers and ſailors in Europe. The command was given to Lord Howe, who was accompanied in the expedition by Admirals Barrington, Milbank, Hood, Sir Richard Hughes, and Commodore Hotham, all of them men eminent in their profeſſion. At the ſame time alſo it fortunately happened, that a large Britiſh fleet of merchantmen had juſt arrived in ſafety from the Baltic; and that a Dutch ſquadron which had been cruiſing on their own coaſts, not being able to penetrate ſouthwards in order to join the French, had retired into port, and given up the intention of effecting any junction for that ſeaſon.

At this time the Britiſh nation was in the utmoſt anxiety about the fate of Gibraltar. The progreſs of the ſhips was delayed by contrary winds, and it was not until they had gained the ſouthern coaſt of Portugal that they received information of the defeat of the enemy's attempt on the 13th of September. On the 11th of October, Lord Howe entered the Straits, and ſeveral of the ſtore ſhips deſtined for Gibraltar came ſafe to anchor under the cannon of the fort without any moleſtation from the enemy. The combined fleet in the mean time had been much damaged by a ſtorm; two ſhips of the line were driven aſhore near Algeſiras; two more were driven out of the bay into the Mediterranean; others loſt their maſts, and moſt of them ſuffered conſiderably. One in particular, a ſhip of 70 guns, was carried by the ſtorm acroſs the bay, and ran aground under the works of Gibraltar, where ſhe was taken by the garriſon, with her whole complement of men, conſiſting of 700. Notwithſtanding the endeavours of the enemy to deſtroy her, ſhe was ſafely got off, and properly repaired. The combined fleet, however, put to ſea on the 13th, with a view to prevent the remaining ſtoreſhips that had overſhot the bay to the eaſt from making good their entrance into it; and at the ſame time to rejoin the two ſhips that had been ſeparated from the main body by the ſtorm. Having the advantage of the wind, they bore down upon the Britiſh fleet, which drew up in order of battle to receive them; but notwithſtanding their ſuperiority, they declined coming to an engagement. On the wind becoming more favourable next day, Lord Howe took the opportunity to bring in the ſtoreſhips that were in company; and the day following the remainder were conveyed to Gibraltar, the troops for the reinforcement of the garriſon were landed, with a large ſupply of powder, and ample proviſion in every other reſpect. As they returned through the ſtraits they were threatened with an engagement by the combined fleets; but though the latter had a ſuperiority of 12 ſhips of the line, they kept a wary diſtance. Some firing indeed took place, but it was attended with little effect on either ſide.

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48 The garriſon finally relieved.

This laſt relief proved entirely deciſive; for though the blockade continued till news arrived of the preliminaries of peace being ſigned, in the beginning of February 1783, no other attack was made. The news of the pacification was received with the utmoſt joy by the Spaniards. Mutual civilities paſſed between the commanders in chief, and the Duke de Crillon paid many handſome compliments to the governor and garriſon for their noble defence; declaring that he had exerted himſelf to the utmoſt of his abilities, and though he had not proved ſucceſsful, yet he was happy in having his ſovereign's approbation of his conduct.

49 Importance of Gibraltar.

The poſſeſſion of Gibraltar is eſteemed of very great conſequence to Britain. It not only gives us the command of the Straits, and their navigation; but affords refreſhment and accommodation to our fleets in time of war, and to our merchantmen at all times; which, to a maritime power, is of very great advantage. From its ſituation, it divides both the kingdoms of France and Spain; that is, it hinders a ready communication by ſea between the different parts of theſe kingdoms. This, of courſe, hinders the conjunction of their fleets and ſquadrons with each other, or at leaſt renders it ſo difficult as to be a perpetual check upon theſe ambitious powers. It awes alſo the piratical ſtates of Barbary, and in like manner the emperor of Morocco; inſomuch, that our commerce is more ſafe than that of any other European power, which gives us great advantages in point of freight. It is otherwiſe highly favourable to our trade in the Mediterranean and Levant. It procures us the reſpect of the Italian and other powers; who, though far diſtant from Britain, muſt conſider this as an inſtance of her power to hurt or aſſiſt them. It alſo ſaves us the expence of ſquadrons or convoys, upon any diſputes or diſturbances that may happen among theſe powers, and which would otherwiſe be neceſſary for the protection of our navigation.

50 Natural hiſtory.

"The form of this mountain is (ſays Major Imric) oblong; its ſummit a ſharp craggy ridge; its direction is nearly from north to ſouth; and its greateſt length, in that direction, falls very little ſhort of three miles. Its breadth varies with the indentations of the ſhore, but it nowhere exceeds three quarters of a mile. The line of its ridge is undulated, and the two extremes are ſomewhat higher than its centre.

"The ſummit of the Sugar Loaf, which is the point

Gibraltar. of its greateſt elevation towards the ſouth, is 1439 feet; the Rock Mortar, which is the higheſt point to the north, is 1350; and the Signal Houſe, which is nearly the central point between theſe two, is 1276 feet above the level of the ſea. The weſtern ſide of the mountain is a ſeries of rugged ſlopes, interſperſed with abrupt precipices. Its northern extremity is perfectly perpendicular, except towards the north-weſt, where what are called the Lines intervene, and a narrow paſſage of flat ground that leads to the iſthmus, and is entirely covered with fortification. The eaſtern ſide of the mountain moſtly conſiſts of a range of precipices; but a bank of land, riſing from the Mediterranean in a rapid acclivity, covers a third of its perpendicular height. Its ſouthern extremity falls, in a rapid ſlope from the ſummit of the Sugar Loaf, into a rocky flat of conſiderable extent, called Windmill hill.

"The principal maſs of the mountain rock conſiſts of a gray, denſe (what is generally called primary) marble; the different beds of which are to be examined in a face of 1350 feet of perpendicular height, which it preſents to Spain in a conical form. Theſe beds, or ſtrata, are of various thickneſs, from 20 to upwards of 40 feet, dipping in a direction from eaſt to weſt, nearly at an angle of 35 degrees. In ſome parts of the ſolid maſs of this rock are found teſtaceous bodies entirely tranſmuted into the conſtituent matter of the rock, and their interior hollows filled up with calcareous ſpar; but theſe do not occur often in its compoſition, and its beds are not ſeparated by any intermediate ſtrata.

"The caves of Gibraltar are many, and ſome of them of great extent. That which moſt deſerves attention and examination is called St Michael's Cave, which is ſituated upon the ſouthern part of the mountain, almoſt equally diſtant from the Signal Tower, and the Sugar Loaf. Its entrance is 1000 feet above the level of the ſea: This entrance is formed by a rapid ſlope of earth, which has fallen into it at various periods, and which leads to a ſpacious hall, incruſted with ſpar, and apparently ſupported in the centre by a large maſſy ſtalactitical pillar. To this ſucceeds a long ſeries of caves of difficult acceſs. In theſe cavernous receſſes, the formation and proceſs of ſtalactites is to be traced, from the flimſy quilt-like cone, ſuſpended from the roof, to the robuſt trunk of a pillar, three feet in diameter, which riſes from the floor, and ſeems intended by Nature to ſupport the roof from which it originated.

"The only inhabitants of theſe caves are bats, ſome of which are of a large ſize. The ſoil, in general, upon the mountain of Gibraltar is but thinly ſown; and in many parts that thin covering has been waſhed off by the heavy autumnal rains, which have left the ſuperficies of the rock, for a conſiderable extent, bare and open to inſpection. In thoſe ſituations, an obſerving eye may trace the effects of the ſlow, but conſtant, decompoſition of the rock, cauſed by its expoſure to the air, and the corroſion of ſea-ſalts, which, in the heavy gales of eaſterly winds, are depoſited with the ſpray on every part of the mountain. Thoſe uncovered parts of the mountain rock alſo expoſe to the eye a phenomenon worthy of ſome attention, as it tends clearly to demonſtrate, that, however high the ſurface of this rock may now be elevated above the level of the ſea, it has once been the bed of agitated waters. This phenomenon is to be obſerved in many parts of the rock, and is conſtantly found in the beds of torrents. It conſiſts of pot-like holes, of various ſizes, hollowed out of the ſolid rock, and formed apparently by the attrition of gravel or pebbles, ſet in motion by the rapidity of rivers or currents in the ſea. Gibraltar.

"Upon the weſt ſide of the mountain, towards its baſe, ſome ſtrata occur, which are heterogeneal to the mountain rock: the firſt, or higheſt, forms the ſegment of a circle; its convex ſide is towards the mountain, and it ſlopes alſo in that direction. This ſtratum conſiſts of a number of thin beds; the outward one, being the thinneſt, is in a ſtate of decompoſition, and is mouldering down into a blackiſh brown or ferruginous coloured earth. The beds, inferior to this, progreſſively increaſe in breadth to 17 inches, where the ſtratification reſts upon a rock of an argillaceous nature.

"This laſt bed, which is 17 inches thick, conſiſts of quartz of a blackiſh blue colour, in the ſepta or cracks of which are found fine quartz cryſtals, colourleſs, and perfectly tranſparent. Theſe cryſtals are compoſed of 18 planes, diſpoſed in hexangular columns, terminated at both extremities by hexangular pyramids. The largeſt of thoſe that Major Imrie ſaw did not exceed one-fourth of an inch in length: They, in general, adhere to the rock by the ſides of the column, but are detached without difficulty. Their great degree of tranſparency has obtained them the name of *Gibraltar diamonds*.

51 Bones found in fiſſures of the rock.

"In the perpendicular fiſſures of the rock, and in ſome of the caverns of the mountain (all of which afford evident proofs of their former communication with the ſurface), a calcareous concretion is found, of a reddiſh brown ferruginous colour, with an earthy fracture, and conſiderable induration, incloſing the bones of various animals, ſome of which have the appearance of being human. Theſe bones are of various ſizes, and lie in all directions, intermixed with ſhells of ſnails, fragments of the calcareous rock, and particles of ſpar; all of which materials are ſtill to be ſeen in their natural uncombined ſtates, partially ſcattered over the ſurface of the mountain. Theſe have been ſwept, by heavy rains at different periods, from the ſurface into the ſituations above deſcribed, and having remained for a long ſeries of years in thoſe places of reſt, expoſed to the permeating action of water, have become enveloped in, and cemented by, the calcareous matter which it depoſits.

"The bones, in this compoſition, have not the ſmalleſt appearance of being petrified; and if they have undergone any change, it is more like that of calcination than that of petrifaction, as the moſt ſolid parts of them generally admit of being cut and ſcraped down with the ſame eaſe as chalk.

"Bones combined in ſuch concretions are not peculiar to Gibraltar: they are found in ſuch large quantities in the country of Dalmatia and upon its coaſts, in the iſlands of Cherſo and Oſero, that ſome naturaliſts have been induced to go ſo far as to aſſert, that there has been a regular ſtratum of ſuch matter in that country, and that its preſent broken and interrupted appearance has been cauſed by earthquakes, or other convulſions, experienced in that part of the globe. But, of late years, a traveller (Abbé Alberto Fortis) has given a minute deſcription of the concretion in which the bones are found in that country: And by his account it appears, that with regard to ſituation, compoſition, and

Gibraltar. colour, it is perfectly ſimilar to that found at Gibraltar. By his deſcription, it alſo appears that the two mountain rocks of Gibraltar and Dalmatia conſiſt of the ſame ſpecies of calcareous ſtone; from which it is to be preſumed, that the concretions in both have been formed in the ſame manner and about the ſame periods.

"Perhaps if the fiſſures and caves of the rocks of Dalmatia were ſtill more minutely examined, their former communications with the ſurface might yet be traced, as in thoſe deſcribed above; and, in that caſe, there would be at leaſt a ſtrong probability, that the materials of the concretions of that country have been brought together by the ſame accidental cauſe which has probably collected thoſe found in the caverns of Gibraltar. Major Imrie traced, in Gibraltar, this concretion, from the loweſt part of a deep perpendicular fiſſure, up to the ſurface of the mountain. As it approached to the ſurface, the concretion became leſs firmly combined, and, when it had no covering of the calcareous rock, a ſmall degree of adheſion only remained, which was evidently produced by the argillaceous earth, in its compoſition, having been moiſtened by rain and baked by the ſun.

"The depth at which theſe materials had been penetrated by that proportion of ſtalactitical matter, capable of giving to the concretion its greateſt adheſion and ſolidity, he found to vary according to its ſituation, and to the quantity of matter to be combined. In fiſſures, narrow and contracted, he found the concretion poſſeſſing a great degree of hardneſs at ſix feet from the ſurface; but in other ſituations, more extended, and where a larger quantity of the materials had been accumulated, he found it had not gained its greateſt degree of adheſion at double that depth. In one of the caves, where the maſs of concretion is of conſiderable ſize, he perceived it to be divided into different beds, each bed being covered with a cruſt of the ſtalactitical ſpar, from one inch to an inch and a half in thickneſs, which ſeems to indicate, that the materials have been carried in at various periods, and that thoſe periods have been very remote from each other.

"At Roſia bay, upon the weſt ſide of Gibraltar, this concretion is found in what has evidently been a cavern, originally formed by huge unſhapely maſſes of the rock which have tumbled in together. The fiſſure, or cavern, formed by the diſruption and ſubſidence of thoſe maſſes, has been entirely filled up with the concretion, and is now expoſed to full view by the outward maſs having dropped down in conſequence of the encroachments of the ſea. It is to this ſpot that ſtrangers are generally led to examine the phenomenon; and the compoſition, having here attained to its greateſt degree of hardneſs and ſolidity, the haſty obſerver, ſeeing the bones incloſed in what has ſo little the appearance of having been a vacuity, examines no further, but immediately adopts the idea of their being incaſed in the ſolid rock. The communication from this former chaſm, to the ſurface from which it has received the materials of the concretion, is ſtill to be traced in the face of the rock, but its opening is at preſent covered by the baſe of the line wall of the garriſon. Here bones are found that are apparently human; and thoſe of them that appear to be of the legs, arms, and vertebræ of the back, are ſcattered among others of various kinds and ſizes, even down to the ſmalleſt bones of ſmall birds. Major Imrie found here the complete jaw-bone of a ſheep; it Gibraltar. contained its full complement of teeth, the enamel of which was perfect, and its whiteneſs and luſtre in no degree impaired. In the hollow parts of ſome of the large bones was contained a minute cryſtallization of pure and colourleſs calcareous ſpar; but, in moſt, the interior part conſiſted of a ſparry cruſt of a reddiſh colour, ſcarcely in any degree tranſparent.

"At the northern extremity of the mountain, the concretion is generally found in perpendicular fiſſures. The miners there employed upon the fortifications, in excavating one of thoſe fiſſures, found, at a great depth from the ſurface, two ſkulls, which were ſuppoſed to be human; but, to the Major, one of them, if not both, appeared to be too ſmall for the human ſpecies. The bone of each was perfectly firm and ſolid; from which it is to be preſumed, that they were in a ſtate of maturity before they were incloſed in the concretion. Had they appertained to very young children, perhaps the bone would have been more porous, and of a leſs firm texture. The probability is, that they belonged to a ſpecies of monkey, which ſtill continues to inhabit, in conſiderable numbers, thoſe parts of the rock which are to us inacceſſible.

"This concretion varies, in its compoſition, according to the ſituation in which it is found. At the extremity of Prince's Lines, high in the rock which looks towards Spain, it is found to conſiſt only of a reddiſh calcareous earth, and the bones of ſmall birds cemented thereby. The rock around this ſpot is inhabited by a number of hawks, that, in the breeding ſeaſon, neſtle here and rear their young; the bones in this concretion are probably the remains of the food of thoſe birds. At the baſe of the rock, below King's Lines, the concretion conſiſts of pebbles of the prevailing calcareous rock. In this concretion, at a very conſiderable depth under the ſurface, was found the under parts of a glaſs bottle, uncommonly ſhaped, and of great thickneſs; the colour of the glaſs was of a dark green *." * *Phil. Tranſ. Edin.* vol. iv.

"The ſubterranean galleries are very extenſive, pierce the rock in ſeveral places and in various directions, and at various degrees of elevation; all of them have a communication with each other, either by flights of ſteps cut in the rock, or by wooden ſtairs where the paſſages are required to be very perpendicular. 52 Subterranean galleries.

"The centinels may now be relieved during a ſiege from one poſt to another in perfect ſafety; whereas, previouſly to the conſtructing of theſe galleries a vaſt number of men were killed by the Spaniards while marching to their ſeveral ſtations. The width of theſe galleries is about twelve feet, their height about fourteen. The rock is broken through in various places, both for the purpoſe of giving light and for placing the guns to bear on the enemy. In different parts there are ſpacious receſſes, capable of accommodating a conſiderable number of men. To theſe receſſes they give names, ſuch as St Patrick's Chamber, St George's Hall, &c. The whole of theſe ſingular ſtructures have been formed out of the ſolid rock by blaſting with gunpowder. Through the politeneſs of an officer on duty, a place called Smart's Reſervoir was opened for our inſpection, which is a great curioſity, and not generally permitted to be ſhewn. It is a ſpring at a conſiderable depth in the body of the rock, and is above 700 feet above the level of the ſea; we deſcended into the cavern that contains

Gibraltar, Gibſon.

tains it by a rope ladder, and with the aid of lighted candles proceeded through a narrow paſſage over cryſtallized protuberances of the rock till we came to a hollow, which appears to have been opened by ſome convulſion of nature. Here, from a bed of gems, ariſes the ſalutary fount, clear as the brilliant of the eaſt, and cold as the icicle. We hailed the nymph of the grot, and, proſtrating ourſelves, quaffed hygean nectar from her ſparry urn. When reſtored to the light of day, we obtained, through the medium of the ſame gentleman, the key of St George's Hall, at which we arrived by a very intricate and gloomy path to the ſpacious excavation, which is upwards of a hundred feet in length, its height nearly the ſame. It is formed in a ſemicircular part of the rock; ſpacious apertures are broken through, where cannons of a very large calibre command the iſthmus, the Spaniſh lines, and a great part of the bay. The top of the rock is pierced through, ſo as to introduce ſufficient light to enable you to view every part of it. It appears almoſt incredible that ſo large an excavation could be formed by gunpowder, without blowing up the whole of that part of the rock, and ſtill more ſo, that they ſhould be able to direct the operations of ſuch an inſtrument, ſo as to render it ſubſervient to the purpoſe of elegance. We found in the hall a table, placed, I ſuppoſe, for the conveniency of thoſe who are traverſing the rock. The cloth was ſpread, the wine went round, and we made the vaulted roof reſound with the accents of mirth and the ſongs of conviviality *."

* *Month. Mag.* 1793.

GIBSON, RICHARD, an Engliſh painter, commonly called the *Dwarf*, was originally page to a lady at Mortlake; who, obſerving that his genius led him to painting, had the generoſity to get him inſtructed in the rudiments of that part. He devoted himſelf to Sir Peter Lely's manner, and copied his pictures to admiration, eſpecially his portraits: his paintings in water colours were alſo eſteemed. He was in great favour with Charles I. who made him his page of the back ſtairs; and he had the honour to inſtruct in drawing Queen Mary and Queen Anne when they were princeſſes. He married one Mrs Anne Shepherd, who was alſo a dwarf; on which occaſion King Charles I. honoured their marriage with his preſence, and gave away the bride. Mr Waller wrote a poem on this occaſion, entitled "The Marriage of the Dwarfs;" in which are theſe lines:

Deſign or chance makes others wive,
But nature did this match contrive;
Eve might as well have Adam fled,
As ſhe deny'd her little bed
To him for whom heav'n ſeem'd to frame
And meaſure out this only dame."

Mr Fenton, in his notes on this poem, obſerves that he had ſeen this couple painted by Sir Peter Lely; and that they were of an equal ſtature, each being three feet ten inches high. They had nine children, five of whom arrived at maturity; theſe were well proportioned, and of the uſual ſtandard of mankind. But what nature denied this couple in ſtature, ſhe gave them in length of days: for Mr Gibſon died in the 75th year of his age; and his wife, having ſurvived him almoſt 20 years, died in 1709, aged 89.

GIBSON, *Dr Edmund*, biſhop of London, was born in Weſtmoreland, in 1669. He applied himſelf early and vigorouſly to learning, and diſplayed his knowledge in ſeveral writings and tranſlations, which recommended him to the patronage of Archbiſhop Tenniſon. He was appointed domeſtic chaplain to his Grace; and we ſoon after find him rector of Lambeth, and archdeacon of Surry. Becoming thus a member of the convocation, he engaged in a controverſy, which was carried on with great warmth by the members of both houſes, and defended his patron's rights, as preſident, in eleven pamphlets; he then formed and completed his more comprehenſive ſcheme of the legal duties and rights of the Engliſh clergy, which was at length publiſhed under the title of *Codex Juris Eccleſiaſtici Anglicani*, in folio. Archbiſhop Tenniſon dying in 1715, and Dr Wake biſhop of Lincoln being made archbiſhop of Canterbury, Dr Gibſon ſucceeded the latter in the ſee of Lincoln, and in 1720 was promoted to the biſhoprick of London. He now not only governed his dioceſe with the moſt exact regularity, but by his great care promoted the ſpiritual affairs of the church of England colonies in the Weſt Indies. He was extremely jealous of the leaſt of the privileges belonging to the church; and therefore, though he approved of the toleration of the Proteſtant Diſſenters, he continually guarded againſt all the attempts made to procure a repeal of the corporation and teſt acts; in particular, his oppoſition to thoſe licentious aſſemblies called *maſquerades*, gave great umbrage at court, and effectually excluded him from all further favours. He ſpent the latter part of his life in writing and printing paſtoral letters, viſitation-charges, occaſional ſermons, and tracts againſt the prevailing immoralities of the age. His paſtoral letters are juſtly eſteemed as the moſt maſterly productions againſt infidelity and enthuſiaſm. His moſt celebrated work, the *Codex*, has been already mentioned. His other publications are, 1. An edition of Drummond's *Polemo Middinia*, and James V. of Scotland's *Cantilena Ruſtica*, with notes. 2. The *Chronicon Saxonicum*, with a Latin tranſlation, and notes. 3. *Reliquiæ Spelmannianæ*, the poſthumous works of Sir Henry Spelman, relating to the laws and antiquities of England. 4. An edition of *Quintilian de Arte Oratoria*, with notes. 5. An Engliſh tranſlation of Camden's *Britannia*, with additions, two volumes folio: and, 6. A number of ſmall pieces, that have been collected together and printed in three volumes folio.—His intenſe application to ſtudy impaired his health; notwithſtanding which, he attained the age of 79. He expired in September 1748, after an epiſcopate of near 33 years.—With regard to Biſhop Gibſon's private life and character, he was in every reſpect a perfect œconomiſt. His abilities were ſo well adapted to diſcharge the duties of his ſacred function, that during the incapacity of Archbiſhop Wake, the tranſaction of eccleſiaſtical affairs was committed to the biſhop of London. He was a true friend to the eſtabliſhed church and government, and as great an enemy to perſecution. He was uſually conſulted by the moſt learned and exalted perſonages in church and ſtate, and the greateſt deference was paid to his judgment. He poſſeſſed the ſocial virtues in an eminent degree; his beneficence was very extenſive; and he had ſuch generoſity,

Gibſon.

Gibſon || Giggle-wick.

roſity, that he freely gave two thouſand five hundred pounds, left him by Dr Crow, who was once his chaplain, to Crow's own relations, who were very poor.

GIDEON, the ſon of Joaſh, of the tribe of Manaſſeh. He dwelt in the city of Ophrah; and had a very extraordinary call to deliver the Iſraelites from the oppreſſion of the Midianites, to which they had become ſubject after the death of Barak and Deborah. Having effected their deliverance by ſupernatural aid, he was choſen judge of Iſrael in the year of the world 2759, and died in 2768. (See Judges, chap. vi. vii. and viii.).

GIFT, *Donum*, in *Law*, is a conveyance which paſſeth either lands or goods; and is of a larger extent than a grant, being applied to things moveable and immoveable; yet as to things immoveable, when taken ſtrictly, it is applicable only to lands and tenements given in tail; but *gift* and *grant* are too often confounded.

New Year's GIFTS, preſents made on new year's day, as a token of the giver's good will, as well as by way of preſage of a happy year.

This practice is very ancient, the origin of it among the Romans being referred to Tatius king of the Sabines, who reigned at Rome conjointly with Romulus, and who having conſidered as a good omen a preſent of ſome ſprigs of vervain gathered in a wood conſecrated to Strenia the goddeſs of ſtrength, which he received on the firſt day of the new year, authorized this cuſtom afterwards, and gave to theſe preſents the name of Strenæ. However this may be, the Romans on that day celebrated a feſtival in honour of Janus, and paid their reſpects at the ſame time to Juno; but they did not paſs it in idleneſs, leſt they ſhould become indolent during the reſt of the year. They ſent preſents to one another of figs, dates, honey, &c. to ſhow their friends that they wiſhed them a happy and agreeable life. Clients, that is to ſay, thoſe who were under the protection of the great, carried preſents of this kind to their patrons, adding to them a ſmall piece of ſilver. Under Auguſtus, the ſenate, the knights, and the people, preſented ſuch gifts to him, and in his abſence depoſited them in the Capitol. Of the ſucceeding princes ſome adopted this cuſtom, and others aboliſhed it, but it always continued among the people. The early Chriſtians condemned it, becauſe it appeared to be a relick of Paganiſm, and a ſpecies of ſuperſtition; but when it began to have no other object than that of being a mark of veneration and eſteem, the church ceaſed to diſapprove of it.

GIGG, GIGA, or JIG, in *Muſic* and *Dancing*, a gay, briſk, ſprightly compoſition, and yet in full meaſure, as well as the allemand, which is more ſerious. Menage takes the word to ariſe from the Italian *gieg*, a muſical inſtrument mentioned by Dante. Others ſuppoſe it to be derived from the Teutonic *giga*, or *ghiighe*, "a fiddle." This is a favourite air in moſt nations of Europe: its characteriſtic is duple time, marked $\frac{6}{8}$, or $\frac{12}{8}$: it conſiſts of two ſtrains, without any determinate number of bars.

GIGGLEWICK, a town in the weſt riding of Yorkſhire, half a mile from Settle, ſtands on the river Ribble; where, at the foot of a mountain, is a ſpring, the moſt noted in England for ebbing and flowing ſometimes thrice in an hour, and the water ſubſides three quarters of a yard at the reflux, though the ſea is 30 miles off. At this town is an eminent free grammar ſchool; and in the neighbourhood are dug up flags, ſlate, and ſtone.

Giggle-wick || Gilbert.

GIHON, in *Ancient Geography*, one of the rivers of Paradiſe; according to Wells, the eaſtern branch of the Euphrates, into which it divides after its conjunction with the Tigris.

GILAN, or GHILAN, a conſiderable province of Perſia, on the ſide of the Caſpian ſea, to the ſouth-weſt. It is ſuppoſed to be the Hyrcania of the ancients. It is very agreeably ſituated, having the ſea on one ſide and high mountains on the other; and there is no entering in but through narrow paſſes, which may eaſily be defended. The ſides of the mountains are covered with many ſorts of fruit trees, and in the higheſt parts of them there are deer, bears, wolves, leopards, and tygers; which laſt the Perſians have a method of taming, and hunt with them as we do with dogs. Gilan is one of the moſt fruitful provinces of Perſia, and produces abundance of ſilk, oil, wine, rice, and tobacco, beſides excellent fruits. The inhabitants are brave, and of a better complexion than the other Indians, and the women are accounted extremely handſome. Reſht is the capital town.

GILBERT, or GILBERD, *William*, a phyſician, was born at Colcheſter in the year 1540, the eldeſt ſon of the recorder of that borough. Having ſpent ſome time in both univerſities, he went abroad; and at his return ſettled in London, where he practiſed with conſiderable reputation. He became a member of the College of Phyſicians, and phyſician in ordinary to Queen Elizabeth, who, we are told, gave him a penſion to encourage him in his ſtudies. From his epitaph it appears that he was alſo phyſician to King James I. He died in the year 1603, aged 63; and was buried in Trinity church in Colcheſter, where a handſome monument was erected to his memory. His books, globes, inſtruments, and foſſils, he bequeathed to the College of Phyſicians, and his picture to the ſchool gallery at Oxford. He wrote, 1. *De Magnete, magneticiſque corporibus, et de magno magnete tellure, phyſiologia nova;* London 1600, folio. 2. *De mundo noſtro ſublunari philoſophia nova:* Amſterdam 1651, 4to. He was alſo the inventor of two mathematical inſtruments for finding the latitude at ſea without the help of ſun, moon, or ſtars. A deſcription of theſe inſtruments was afterwards publiſhed by Thomas Blondeville in his *Theoriques of the Planets*.

GILBERT, *Sir Humphrey*, a brave officer and ſkilful navigator, was born about the year 1539, in Devonſhire, of an ancient and honourable family. Though a ſecond ſon, he inherited a conſiderable fortune from his father. He was educated at Eton, and afterwards at Oxford; where probably he did not continue long. It ſeems he was intended to finiſh his ſtudies in the Temple; but being introduced at court by his aunt Mrs Catharine Aſhley, then in the queen's ſervice, he was diverted from the ſtudy of law, and commenced ſoldier. Having diſtinguiſhed himſelf in ſeveral military expeditions, particularly that to Newhaven in 1563, he was ſent over to Ireland to aſſiſt in ſuppreſſing a rebellion; where, for his ſignal ſervices, he was made commander in chief and gover-

nor

Gilbert || Gilboa.

nor of Munſter, and knighted by the lord deputy, Sir Henry Sidney, on the firſt day of the year 1570. He returned ſoon after to England, where he married a rich heireſs. Nevertheleſs, in 1572, he ſailed with a ſquadron of nine ſhips to reinforce Colonel Morgan, who at that time meditated the recovery of Fluſhing. Probably on his return to England he reſumed his coſmographical ſtudies, to which he was naturally inclined: for, in the year 1576, he publiſhed his book on the north-weſt paſſage to the Eaſt Indies; and as Martin Frobiſher ſailed in the ſame year, probably it was in conſequence of this treatiſe. In 1578, he obtained from the queen a very ample patent, empowering him to diſcover and poſſeſs in North America any lands then unſettled. He ſailed to Newfoundland, but ſoon returned to England without ſucceſs; nevertheleſs, in 1583, he embarked a ſecond time with five ſhips, the largeſt of which put back on account of a contagious diſtemper on board. Our general landed on Newfoundland on the third of Auguſt, and on the fifth took poſſeſſion of the harbour of St John's. By virtue of his patent he granted leaſes to ſeveral people; but though none of them remained there at that time, they ſettled afterwards in conſequence of theſe leaſes; ſo that Sir Humphrey deſerves to be remembered as the real founder of the vaſt American empire. On the 20th of Auguſt he put to ſea again, on board a ſmall ſloop; which on the 29th foundered in a hard gale of wind. Thus periſhed Sir Humphrey Gilbert; a man of quick parts, a brave ſoldier, a good mathematician, a ſkilful navigator, and of a very enterpriſing genius. We learn alſo, that he was remarkable for his eloquence, being much admired for his patriotic ſpeeches both in the Engliſh and Iriſh parliaments. He wrote "A diſcourſe to prove a paſſage by the northweſt to Cathaia and the Eaſt Indies, printed London 1576." This treatiſe, which is a maſterly performance, is preſerved in Hakluyt's Collection of Voyages, vol. iii. p. 11. The ſtyle is ſuperior to moſt, if not to all, the writers of that age; and ſhows the author to have been a man of conſiderable reading. He mentions, at the cloſe of this work, another treatiſe on navigation, which he intended to publiſh: it is probably loſt.

GILBERTINES, an order of religious, thus called from St Gilbert of Sempringham, in the county of Lincoln, who founded the ſame about the year 1148: the monks of which obſerved the rule of St Auguſtine; and were accounted canons: and the nuns that of St Benedict.

The founder of this order erected a double monaſtery, or rather two different ones, contiguous to each other, the one for men, the other for women, but parted by a very high wall.

St Gilbert himſelf founded 13 monaſteries of this order, viz. four for men alone, and nine for men and women together, which had in them 700 brethren and 1500 ſiſters. At the diſſolution there were about 25 houſes of this order in England and Wales.

GILBOA, in *Ancient Geography*, mountains of Samaria, ſtretching out from weſt to eaſt, on the confines of the half tribe of Manaſſeh, and of the tribe of Iſſachar, and to the ſouth part of the valley of Jezreel; beginning weſtward at the city of Jezreel, ſituated at the foot of theſe mountains, reaching almoſt quite to the Jordan, lying at the diſtance of ſix miles from Scythopolis. Famous for the death of Saul and his ſon Jonathan, and the defeat of the Iſraelites by the Philiſtines. Gilboa || Gildas.

GILCHRIST, Dr Ebenezer, an eminent Scots phyſician, was born at Dumfries in 1707. He began the ſtudy of medicine at Edinburgh, which he afterwards proſecuted at London and Paris. He obtained the degree of doctor of medicine from the univerſity of Rheims; and in the year 1732 he returned to the place of his nativity, where he afterwards conſtantly reſided, and continued the practice of medicine till his death. It may with juſtice be ſaid, that few phyſicians of the preſent century have exerciſed their profeſſion in a manner more reſpectable or ſucceſsful than Dr Gilchriſt; and few have contributed more to the improvement of the healing art. Having engaged in buſineſs at an early period of life, his attention was wholly devoted to obſervation. Endowed by nature with a judgment acute and ſolid, and a genius active and inventive, he ſoon diſtinguiſhed himſelf by departing, in various important particulars, from eſtabliſhed but unſucceſsful modes of practice. Several of the improvements which he introduced have procured him great and deſerved reputation both at home and abroad. His practice, in ordinary caſes, was allowed to be judicious, and placed him high in the confidence and eſteem of the inhabitants of that part of the country where he lived. But his uſefulneſs was not confined to his own neighbourhood. On many occaſions he was conſulted by letter from the moſt diſtant parts of the country. In different collections are to be found ſeveral of his performances, which prove that he had ſomething new and uſeful to offer upon every ſubject to which he applied himſelf. But thoſe writings which do him the greateſt honour are two long diſſertations on Nervous Fevers, in the Medical Eſſays and Obſervations publiſhed by a Society in Edinburgh; and a treatiſe on the uſe of Sea Voyages in Medicine, which firſt made its appearance in the year 1757, and was afterwards reprinted in 1771. By means of the former, the attention of phyſicians was firſt turned to a ſpecies of fever which is now found to prevail univerſally in this country; and the liberal uſe of wine, which he was the firſt among the moderns to recommend, has ſince been adopted in theſe fevers by the moſt judicious phyſicians of the preſent age, and has probably contributed not a little to the ſucceſs of their practice. His treatiſe on Sea Voyages points out their utility in various diſtempers, and particularly in conſumptions, but experience by no means confirms the obſervation, that there is now a proſpect of our being able to employ a remedy in this untractable diſeaſe much more efficacious than any hitherto in uſe. Dr Gilchriſt died in 1774.

GILD, or Guild. See Guild.

GILDAS, ſurnamed *the Wiſe*, was born in Wales in the year 511. Where he was educated is uncertain; but it appears from his own writings that he was a monk. Some writers ſay that he went over to Ireland; others, that he viſited France and Italy. They agree however in aſſerting, that after his return to England he became a celebrated and moſt aſſiduous preacher of the goſpel. Du Pin ſays he founded a monaſtery at Venetia in Britain. Gildas is the only Britiſh author of the ſixth century whoſe works are printed;

Gildas, Gilding.

printed; they are therefore valuable on account of their antiquity, and as containing the only information we have concerning the times of which he wrote. His Hiſtory of Britain is, however, a very ſlimſy performance, and his ſtyle obſcure and inelegant.

GILDING, the art of ſpreading or covering a thing over with gold, either in leaf or liquid. The art of gilding was not unknown among the ancients, though it never arrived among them at the perfection to which the moderns have carried it. Pliny aſſures us, that the firſt gilding ſeen at Rome was after the deſtruction of Carthage, under the cenſorſhip of Lucius Mummius, when they began to gild the ceilings of their temples and palaces; the Capitol being the firſt place on which this enrichment was beſtowed. But he adds, that luxury advanced on them ſo haſtily, that in a little time you might ſee all, even private and poor perſons, gild the very walls, vaults, &c. of their houſes.

1 Gilding when firſt introduced at Rome.

We need not doubt but they had the ſame method with us, of beating gold, and reducing it into leaves; though it ſhould ſeem they did not carry it to the ſame height, if it be true which Pliny relates, that they only made 750 leaves of four fingers ſquare out of a whole ounce. Indeed he adds, that they could make more; that the thickeſt were called *bracteæ Præneſtinæ*, by reaſon of a ſtatue of the goddeſs Fortune at Præneſte gilt with ſuch leaves; and that the thinner ſort was called *bracteæ queſtoriæ*.

The modern gilders do alſo make uſe of gold leaves of divers thickneſſes; but there are ſome ſo fine, that a thouſand do not weigh above four or five drachms. The thickeſt are uſed for gilding on iron and other metals; and the thinneſt on wood. But we have another advantage over the ancients in the manner of uſing or applying the gold: the ſecret of painting in oil, diſcovered of late ages, furniſhes us with means of gilding works that ſhall endure all the injuries of time and weather, which to the ancients was impracticable.—They had no way to lay the gold on bodies that would not endure the fire but with whites of eggs or ſize, neither of which will endure the water; ſo that they could only gild ſuch places as were ſheltered from the moiſture of the weather.

2 Ancient gilding inferior to the modern.

The Greeks called the compoſition on which they applied their gilding on wood *leucophæum* or *leucophorum*; which is deſcribed as a ſort of glutinous compound earth, ſerving in all probability to make the gold ſtick and bear poliſhing. But the particulars of this earth, its colour, ingredients, &c. the antiquaries and naturaliſts are not agreed upon.

The luſtre and beauty of gold have occaſioned ſeveral inquiries and diſcoveries concerning the different methods of applying it to different ſubſtances. Hence the art of gilding is very extenſive, and contains many partieular operations and various management.

3 Falſe gilding with laquer or Dutch leaf.

A colour of gold is given by painting and by varniſhes, without employing gold; but this is a falſe kind of gilding. Thus a very fine golden colour is given to braſs and to ſilver, by applying upon theſe metals a gold-coloured varniſh, which, being tranſparent, ſhows all the brilliancy of the metals beneath. Many ornaments of braſs were varniſhed in this manner, which is called *gold laquering*, to diſtinguiſh them from thoſe which are really gilt. Silver leaves thus varniſhed are put upon leather, which is then called *gilt leather*. See LAQUER. Gilding.

Amongſt the falſe gilding may alſo be reckoned thoſe which are made with thin leaves of copper or braſs, called *Dutch leaf*. In this manner are made all the kinds of what is called *gilt paper*.

In the true gilding, gold is applied to the ſurface of bodies. The gold intended for this purpoſe ought in general to be beat into thin leaves, or otherwiſe divided into very fine parts.

4 Gilding with ſize.

As metals cannot adhere well merely by contact to any but to other metallic ſubſtances, when gold is to be applied to the ſurface of ſome unmetallic body, that ſurface muſt be previouſly covered with ſome gluey and tenacious ſubſtance by which the gold ſhall be made to adhere. Theſe ſubſtances are in general called *ſizes*. Some of theſe are made of vegetable and animal glues, and others of oily, gluey, and drying matters. Upon them the leaves of gold are applied, and preſſed down with a little cotton or a hare's foot; and when the whole is dry, the work is to be finiſhed and poliſhed with a hard inſtrument, called a *dog's tooth*, to give luſtre.

5 With oil.

When the work is required to be capable of reſiſting rain or moiſture, it ought to be previouſly covered with a compoſition of drying oil and yellow ochre ground together; otherwiſe a water ſize may be uſed, which is prepared by boiling cuttings of parchment or white leather in water, and by mixing with this ſome chalk or whiting: ſeveral layers of this ſize muſt be laid upon the wood, and over theſe a layer of the ſame ſize mixed with yellow ochre. Laſtly, Another mixture, called *gold ſize*, is to be applied above theſe; upon which the gold leaves are to be fixed. This gold ſize, the uſe of which is to make the gold leaf capable of being burniſhed, is compoſed of tobacco-pipe clay, ground with ſome ruddle or black lead, and tempered with a little tallow or oil of olives. The edges of glaſſes may be gilt by applying firſt a very thin coat of varniſh, upon which the gold leaf is to be fixed; and when the varniſh is hardened, may be burniſhed. This varniſh is prepared by boiling powdered amber with linſeed oil in a braſs veſſel to which a valve is fitted, and by diluting the above ſolution with four or five times its quantity of oil of turpentine; and that it may dry ſooner, it may be ground with ſome white lead.

6 Of gilding metals.

The method of applying gold upon metals is entirely different. The ſurface of the metal to be gilt is firſt to be cleaned; and then leaves are to be applied to it, which, by means of rubbing with a poliſhed bloodſtone, and a certain degree of heat, are made to adhere perfectly well. In this manner ſilver leaf is fixed and burniſhed upon braſs in the making of what is called *French plate*, and ſometimes alſo gold leaf is burniſhed upon copper and upon iron.

Gold is applied to metals in ſeveral other ways. One of theſe is by previouſly forming the gold into a paſte or amalgam with mercury. In order to obtain a ſmall amalgam of gold and mercury, the gold is firſt to be reduced into thin plates or grains, which are heated red hot, and thrown into mercury previouſly heated, till it begins to ſmoke. Upon ſtirring the mercury with an iron rod, the gold totally diſappears. The proportion of mercury to gold is generally as ſix or eight to one.

With

Gilding. With this amalgam the ſurface of the metal to be gilded is to be covered; then a ſufficient heat is to be applied to evaporate the mercury: and the gold is laſtly to be burniſhed with a blood-ſtone.

This method of gilding by amalgamation is chiefly uſed for gilding copper, or an alloy of copper, with a ſmall portion of zinc, which more readily receives the amalgam; and is alſo preferable for its colour, which more reſembles that of gold than the colour of copper. When the metal to be gilt is wrought or chaſed, it ought to be previouſly covered with quickſilver before the amalgam is applied, that this may be eaſier ſpread: but when the ſurface of the metal is plain, the amalgam may be applied directly to it. The quickſilver or amalgam is made to adhere to the metal by means of a little aquafortis, which is rubbed on the metallic ſurface at the ſame time, by which this ſurface is cleanſed from any ruſt or tarniſh which might prevent the union or adheſion of the metals. But the uſe of the nitrous acid in this operation is not, as is generally ſuppoſed, confined merely to cleanſe the ſurface of the metal to be gilt from any ruſt or tarniſh it may have acquired; but it alſo greatly facilitates the application of the amalgam to the ſurface of that metal, probably in the following manner: It firſt diſſolves part of the mercury of the amalgam; and when this ſolution is applied to the copper, this latter metal having a ſtronger affinity for nitrous acid than the mercury has, precipitates the mercury upon its ſurface, in the ſame manner as a poliſhed piece of iron precipitates copper upon its ſurface from a ſolution of blue vitriol. When the metal to be gilt is thus covered over with a thin precipitated coat of mercury, it readily receives the amalgam. In this ſolution and precipitation of mercury, the principal uſe of the nitrous acid in the proceſs of gilding appears to conſiſt. The amalgam being equally ſpread over the ſurface of the metal to be gilt by means of a bruſh, the mercury is then to be evaporated by a heat juſt ſufficient for that purpoſe; for if it be too great, part of the gold may alſo be expelled, and part of it will run together, and leave ſome of the ſurface of the metal bare: while the mercury is evaporating, the piece is to be from time to time taken from the fire, that it may be examined, that the amalgam may be ſpread more equally by means of a bruſh, that any defective parts of it may be again covered, and that the heat may not be too ſuddenly applied to it: when the mercury is evaporated, which is known by the ſurface being entirely become of a dull yellow colour, the metal muſt then undergo other operations, by which the fine gold colour is given to it. Firſt, The gilded piece of metal is rubbed with a ſcratch bruſh (which is a bruſh compoſed of braſs wire) till its ſurface is made ſmooth; then it is covered over with a compoſition called *gilding wax*, and is again expoſed to the fire till the wax be burnt off. This wax is compoſed of bees wax, ſometimes mixed with ſome of the following ſubſtances; red ochre, verdigriſe, copper ſcales, alum, vitriol, borax: but according to Dr Lewis, the ſaline ſubſtances alone are ſufficient, without any wax. By this operation the colour of the gilding is heightened; and this effect ſeems to be produced by a perfect diſſipation of ſome mercury remaining after the former operation. This diſſipation is well effected by this equable application of heat. The gilt

7 Uſe of the nitrous acid in gilding.

ſurface is then covered over with a ſaline compoſition, conſiſting of nitre, alum, or other vitriolic ſalt, ground together, and mixed up into a paſte with water or urine. The piece of metal thus covered is expoſed to a certain degree of heat, and then quenched in water. By this method its colour is further improved, and brought nearer to that of gold. This effect ſeems to be produced by the acid of nitre (which is diſengaged by the vitriolic acid of the alum, or other vitriolic ſalt, during the expoſure to heat) acting upon any particles of copper which may happen to lie on the gilded ſurface. Laſtly, Some artiſts think that they give an additional luſtre to their gilt work by dipping it in a liquor prepared by boiling ſome yellow materials, as ſulphur, orpiment, or turmeric. The only advantage of this operation is, that a part of the yellow matter, as the ſulphur or turmeric, remains in ſome of the hollows of the carved work, in which the gilding is apt to be more imperfect, and to which it gives a rich and ſolid appearance.

Gilding.

Iron cannot be gilt by amalgamation, unleſs, as it is ſaid, it be previouſly coated with copper by dipping in a ſolution of blue vitriol. Iron may alſo receive a golden coat from a ſaturated ſolution of gold in aqua-regia, mixed with ſpirit of wine, the iron having a greater affinity with the acid, from which it therefore precipitates the gold. Whether any of theſe two methods be applicable to uſe, is uncertain: but the method commonly employed of fixing gold upon iron is that above mentioned, of burniſhing gold leaf upon this metal when heated ſo as to become blue; and the operation will be more perfect if the ſurface has been previouſly ſcratched or graved.

Another method is mentioned by authors of gilding upon metals, and alſo upon earthen ware, and upon glaſs; which is, to fuſe gold with regulus of antimony, to pulverize the maſs which is ſufficiently brittle to admit that operation, to ſpread this powder upon the piece to be gilt, and expoſe it to ſuch a fire that the regulus may be evaporated, while the gold remains fixed. The inconveniences of this method, according to Dr Lewis, are, that the powder does not adhere to the piece, and cannot be equally ſpread; that part of the gold is diſſipated along with the regulus; that glaſs is fuſible with the heat neceſſary for the evaporation of regulus of antimony; and that copper is liable to be corroded by the regulus, and to have its ſurface rendered uneven.

8 Improvement by Dr Lewis. *Phil. Com. of Arts.*

On this ſubject of gilding by amalgamation Dr Lewis has the following remarks. "There are two principal inconveniences in this buſineſs: One, that the workmen are expoſed to the fumes of the mercury, and generally, ſooner or later, have their health greatly impaired by them: the other, the loſs of the mercury; for though part of it is ſaid to be detained in cavities made in the chimney for that purpoſe, yet the greateſt part of it is loſt. From ſome trials I have made, it appeared that both theſe inconveniences, particularly the firſt and moſt conſiderable one, might in good meaſure be avoided, by means of a furnace of a due conſtruction. If the communication of a furnace with its chimney, inſtead of being over the fire, is made under the grate, the aſh-pit door, or other apertures beneath the grate, cloſed, and the mouth of the furnace left open; the current of air, which otherwiſe would have entered be-

Gilding. neath, enters now at the top, and paſſing down through the grate to the chimney, carries with it completely both the vapour of the fuel and the fumes of ſuch matters as are placed upon it: the back part of the furnace ſhould be raiſed a little higher above the fire than the fore part, and an iron plate laid over it, that the air may enter only at the front, where the workman ſtands, who will be thus effectually ſecured from the fumes and from being incommoded with the heat, and at the ſame time have full liberty of introducing, inſpecting, and removing the work. If ſuch a furnace is made of ſtrong forged (not milled) iron plate, it will be ſufficiently durable: the upper end of the chimney may reach above a foot and a half higher than the level of the fire: over this is to be placed a larger tube, leaving an interval of an inch or more all round between it and the chimney, and reaching to the height of 10 or 12 feet, the higher the better. The external air, paſſing up between the chimney and the outer pipe, prevents the latter from being much heated, ſo that the mercurial fumes will condenſe againſt its ſides into running quick-ſilver, which, falling down to the bottom, is there catched in a hollow rim, formed by turning inwards a portion of the lower part, and conveyed, by a pipe at one ſide, into a proper receiver.

9 M. du Fay's method of raiſing gold figures. "Mr Hellot communicates, in the Memoirs of the French Academy for the year 1745, a method of making raiſed figures of gold on works of gold or ſilver, found among the papers of M. du Fay, and of which M. du Fay himſelf had ſeen ſeveral trials. Fine gold in powder, ſuch as reſults from the parting of gold and ſilver by aquafortis, is directed to be laid in a heap on a levigating ſtone, a cavity made in the middle of the heap, and half its weight of pure mercury put into the cavity; ſome of the fetid ſpirit obtained from garlic root by diſtillation in a retort, is then to be added, and the whole immediately mingled and ground with a muller till the mixture is reduced into an uniform gray powder. The powder is to be ground with lemon juice to the conſiſtence of paint, and applied on the piece previouſly well cleaned and rubbed over with the ſame acid juice; the figures drawn with it may be raiſed to any degree by repeating the application. The piece is expoſed to a gentle fire till the mercury is evaporated ſo as to leave the gold yellow, which is then to be preſſed down, and rubbed with the finger and a little ſand, which makes it appear ſolid and brilliant; after this it may be cut and embelliſhed. The author obſerves, that being of a ſpongy texture, it is more adviſable to cut it with a chiſſel than to raiſe it with a graver; that it has an imperfection of being always pale; and that it would be a deſirable thing to find means of giving it colour, as by this method ornaments might be made of exquiſite beauty and with great facility. As the paleneſs appears to proceed from a part of the mercury retained by the gold, I apprehend it might be remedied by the prudent application of a little warm aquafortis, which diſſolving the mercury from the exterior part, would give at leaſt a ſuperficial high colour: if the piece is ſilver, it muſt be defended from the aquafortis by covering it with wax. Inſtruments and ornaments of gold, ſtained by mercury where the gold is connected with ſubſtances incapable of bearing fire, may be reſtored to their colour by the ſame means.

Gilding. "The foregoing proceſs is given entirely on the authority of the French writer. I have had no experience of it myſelf, but have ſeen very elegant figures of gold raiſed upon ſilver, on the ſame principle, by a different procedure. Some cinnabar was ground, not with the diſtilled ſpirit, but with the expreſſed juice of garlic, a fluid remarkably tenacious. This mixture was ſpread all over the poliſhed ſilver; and when the firſt layer is dry, a ſecond, and after this a third, was applied. Over theſe were ſpread as many layers of another mixture, compoſed chiefly of aſphaltum and linſeed oil boiled down to a due conſiſtence. The whole being dried with a gentle heat on a kind of wire grate, the figures were traced and cut down to the ſilver ſo as to make its ſurface rough: the inciſions were filled with an amalgam of gold, raiſed to different heights in different parts according to the nature of the deſign; after which a gentle fire, at the ſame time that it evaporated the mercury, deſtroyed the tenacity of the gummy juice, ſo that the coating, which ſerved to confine the amalgam, and as a guide in the application of it, was now eaſily got off. The gold was then preſſed down and embelliſhed as in the former method; and had this advantage, that the ſurface of the ſilver under it having been made rough, it adhered more firmly, ſo as not to be in danger of coming off, as M. du Fay ſays the gold applied in his way ſometimes did. The artiſt, however, found the proceſs ſo troubleſome, that though he purchaſed the receipt for a conſiderable ſum, he has laid the practice aſide."

10 Another method. Finally, Some metals, particularly ſilver, may be gilt in the following manner:

11 Eaſy method of gilding ſilver. Let gold be diſſolved in aqua-regia. In this ſolution pieces of linen are to be dipt, and burnt to black aſhes. Theſe aſhes being rubbed on the ſurface of the ſilver by means of a wet linen rag, apply the particles of gold which they contain, and which by this method adhere very well. The remaining part of the aſhes is to be waſhed off; and the ſurface of the ſilver, which in this ſtate does not ſeem to be gilt, is to be burniſhed with a blood-ſtone, till it acquire a fine colour of gold. This method of gilding is very eaſy, and conſumes a very ſmall quantity of gold. Moſt gilt ornaments upon fans, ſnuff boxes, and other toys of much ſhow and little value, are nothing but ſilver gilt in this manner.

12 Methods of gilding glaſs. Gold may alſo be applied to glaſs, porcelain, and other vitrified matters. As the ſurface of theſe matters is very ſmooth, and conſequently is capable of a very perfect contact with gold leaves, theſe leaves adhere to them with ſome force, although they are not of metallic nature. This gilding is ſo much more perfect, as the gold is more exactly applied to the ſurface of the glaſs. The pieces are then to be expoſed to a certain degree of heat, and burniſhed ſlightly to give them luſtre.

A more ſubſtantial gilding is fixed upon glaſs, enamel, and porcelain, by applying to theſe ſubſtances powder of gold mixed with a ſolution of gum arabic, or with ſome eſſential oil, and a ſmall quantity of borax; after which a ſufficient heat is to be applied to ſoften the glaſs and the gold, which is then to be burniſhed. With this mixture any figures may be drawn. The powders for this purpoſe may be made, 1. By grinding gold leaf with honey, which is afterwards

Gilding || Gill.

to be washed away with water. 2. By distilling to dryness a solution of gold in aqua-regia. 3. By evaporating the mercury from an amalgam of gold, taking care to stir well the mass near the end of the process. 4. By precipitating gold from its solution in aqua-regia, by applying to it a solution of green vitriol in water, or some copper, and perhaps some other metallic substances.

GILEAD, the son of Machir, and grandson of Manasseh, had his inheritance allotted him in the mountains of Gilead, from whence he took his name. The mountains of Gilead were part of that ridge which runs from Mount Lebanon southward, on the east of the Holy Land; gave their name to the whole country which lies on the east of the sea of Galilee, and included the mountainous region called in the New Testament *Trachonitis*. Jeremiah (xxii. 6.) seems to say, that Gilead begins from Mount Libanus. 'Thou art Gilead unto me, and the head of Lebanon.' Jacob, at his return from Mesopotamia, came in six days to the mountains of Gilead (Gen. xxxi. 21. &c.) where this patriarch, with Laban his father-in-law, raised a heap of stones, in memory of their agreement and covenant, and called it *Galeed*, i. e. "an heap of witnesses," and which Laban called *Jegar-sahadutha*. These mountains were covered with a sort of trees abounding with gum, called the *Balm of Gilead*, which the Scripture commends much (Jer. viii. 21. xlvi. 11. li. 8.). The merchants who bought Joseph came from Gilead, and were carrying balm into Egypt, (Gen. xxxvii. 25.).

The Gileadites being invaded by the Ammonites, &c. chose Jephthah for their general, who vanquished all their enemies.

Balm of GILEAD. See AMYRIS, BOTANY *Index*.

GILGAL, in *Ancient Geography*, a place between Jericho and Jordan, noted for the first encampment of the Israelites on this side Jordan, about a mile from Jericho. It sometimes also denotes Galilee, (Joshua xii. 23.).

GILL, JOHN, D. D. a Protestant dissenting minister of the Baptist denomination, and the son of Edward and Elizabeth Gill, was born at Kettering in Northamptonshire, November 23. 1697. At a very early period of life, his father, who was a deacon of the Baptist church at Kettering, discovered in him an uncommon capacity for learning; and his ability for literary pursuits afterwards appeared by the rapid progress in whatever became the object of his study. He was sent to a grammar school in the neighbourhood; where he soon surpassed those boys who were much his seniors in age and as pupils. At this school he continued till he arrived at his 11th year; where he read most of the Latin classics, and made considerable proficiency in the Greek language.

Mr Gill's celebrity as a scholar, and his strong attachment to books, were soon observed by the neighbouring clergy, who frequently met and conversed with him at a bookseller's shop, to which he resorted for the purpose of reading; and indeed such was his application to books, that it became a proverbial saying among the common people, "Such a thing is as certain, as that John Gill is in the bookseller's shop."

He left the grammar school, however, early in life. This was occasioned by the imperious conduct of his master, who insisted that the children of dissenting parents should, with other scholars that belonged to the establishment, attend him to church on week days during the performance of divine service. The dissenters considered this requisition as a stretch of power to which his engagements with them gave no claim; and as it was virtually making conformity a test by which his pupils were to expect the benefits of tuition, they resented his conduct; and the children of those parents that were in affluent circumstances were removed to seminaries where the same advantages might be obtained without being subject to the impositions of clerical bigotry. But as the parents of Mr Gill had it not in their power to confer on him the same privilege, the same steps could not be taken to facilitate his advancement in learning. To pave the way, however, for the completion of his studies, efforts were made by several ministers, of different denominations, to get him upon one or other of the funds in London. For this purpose specimens of his progress in the different branches of literature were transmitted to the metropolis: in answer to which it was objected, "that he was too young, and that should he continue, as it might be expected he would, to make such rapid advances in his studies, he would go through the common circle before he would be capable of taking care of himself, or of being employed in any public service." But these formidable objections were of no weight with our young scholar: his love of learning was unconquerable. Insuperable difficulties, it is true, obstructed the way in which literary eminence is usually acquired; but these difficulties could neither repress his ardent desire of knowledge, nor damp the zeal and application that had marked his former studies. For though his time was daily devoted to the business of his father; yet he had so far improved the hours of leisure, as to be able, before he arrived at his 19th year, to read all the Greek and Latin authors that fell in his way. He studied logic, rhetoric, moral and natural philosophy; and learnt the Hebrew language so as to read it with ease, without any other assistance than Buxtorf's grammar and lexicon. Gill.

Neither the pursuit of learning, however, nor the other necessary avocations incumbent on Mr Gill, could eradicate those religious impressions received in early life. On November 1. 1716, he made a public profession of his faith before the Baptist church at Kettering, and was baptized the same day by Mr Thomas Wallis. Of this church Mr Gill had not been long a member before he was called to the work of the ministry: soon after which, he removed to Higham-Ferrers, with a view to pursue his studies under the direction of Mr Davis; but his stay at this place was soon interrupted by an invitation from London in 1719, to preach to the Baptist church in Horslydown, over which he was the same year, being the 22d of his age, ordained pastor; which office he sustained upwards of 51 years.

Mr Gill had not been long in London, before rabbinical learning, of which he had before considerable knowledge, became an object of pursuit. To facilitate his progress through the intricacies of this labyrinth, he contracted an acquaintance with one of the most learned Jewish rabbies. He read the Targums, the Talmuds, the Rabbot, their ancient commentaries, the book Zohar, and whatever else of this kind he was able to procure. Of the oriental languages he made

Gill. himſelf a complete maſter: in ſhort, there was no branch of knowledge that could either enlarge or enrich Biblical learning, which, however difficult, was not attempted and attained: and it may be truly aſſerted, that in this line he had but few equals, and that the annals of literature do not exhibit a character by whom he was excelled.

In 1748, Mr Gill publiſhed a commentary on the New Teſtament, in three volumes folio. The immenſe reading and learning diſcoverable in this arduous work, attracted the attention of the Mariſchal College and Univerſity of Aberdeen; and procured for him, without either his ſolicitation or his knowledge, a diploma, creating him doctor in divinity. This intelligence was communicated to the doctor in the moſt handſome terms by the profeſſors Oſborn and Pollock; who declared, "that on account of his knowledge of the Scriptures, of the Oriental languages, and of Jewiſh antiquities, of his learned defence of the Scriptures againſt Deiſts and Infidels, and the reputation gained by his other works; the univerſity had, without his privity, unanimouſly agreed to confer on him the degree of doctor in divinity."

Dr Gill's ſentiments, as a divine, were throughout Calviniſtic: "And perhaps no man (ſays the Rev. Mr Toplady, a miniſter in the church of England) ſince the days of Auſtin, has written ſo largely in defence of the ſyſtem of grace; and certainly no man has treated that momentous ſubject in all its branches, more cloſely, judiciouſly, and ſucceſsfully. What was ſaid of Edward the Black Prince, that he never fought a battle which he did not win; what has been remarked of the great duke of Marlborough, that he never undertook a ſiege which he did not carry; may be juſtly accommodated to our great philoſopher and divine; who, ſo far as the diſtinguiſhing doctrines of the goſpel are concerned, never beſieged an error which he did not force from its ſtrong holds, nor ever encountered an adverſary whom he did not baffle and ſubdue. His learning and labours, if exceedable, were exceeded only by the invariable ſanctity of his life and converſation. From his childhood to his entrance on the miniſtry, and from his entrance on the miniſtry to the moment of his diſſolution, not one of his moſt inveterate oppoſers was ever able to charge him with the leaſt ſhadow of immorality. Himſelf, no leſs than his writings, demonſtrated that the doctrine of grace does not lead to licentiouſneſs. Thoſe who had the honour and happineſs of being admitted into the number of his friends, can go ſtill farther in their teſtimony. They know that his moral demeanor was more than blameleſs: it was from firſt to laſt conſiſtently exemplary. And indeed an undeviating conſiſtency, both in his views of evangelical truths, and in his obedience as a ſervant of God, was one of thoſe qualities by which his caſt of character was eminently marked. He was in every reſpect a burning and a ſhining light: Burning with love to God, to truth, and to ſouls; ſhining as an example to believers, in word, in faith, in purity; a pattern of good works, and a model of all holy converſation and godlineſs; and while true religion and ſound learning have a ſingle friend remaining in the Britiſh empire, the works and name of Gill will be precious and revered."

He died at Camberwell, October 14. 1771, aged 73 years 10 months and 10 days. In 1718, the Doctor married Mrs Elizabeth Negus; by whom he had many children, two of whom only ſurvived him. Mrs Gill died in 1764. Gill || Gilolo.

His works are, A Commentary on the Old and New Teſtament in 9 vols folio. A Body of Divinity in 3 vols quarto. The Cauſe of God and Truth, 4 vols 8vo. A Treatiſe concerning the Prophecies of the Old Teſtament reſpecting the Meſſiah. A Diſſertation on the antiquity of the Hebrew Language, Letters, Vowel Points, and Accents. Sermons on the Canticles, folio; beſides a great number of ſermons and controverſial pieces on different ſubjects.

GILL, a meaſure of capacity, containing a quarter of an Engliſh pint.

GILLS or BRANCHIÆ of fiſhes. See ANATOMY *Index*.

GILLINGHAM, a pariſh in Dorſetſhire, on the river Stour, near the foreſt of its own name; where, anno 1016, King Edmund Ironſide vanquiſhed the Danes. It is one of the largeſt pariſhes in the county, being 41 miles in circuit, containing 64,000 acres. It lies on the borders of Wilts and Somerſet, four miles north-weſt of Shaftſbury. It has a manufacture of linen, but the chief produce is grazing and the dairies. Near it are the traces of an ancient reſidence of Norman or Saxon kings, 320 feet long and 240 broad, ſurrounded by a rampart of earth. Henry I. reſided here, and King John repaired it at the expence of the county. Edward I. ſpent his Chriſtmas here in 1270; but the whole of the materials are removed, and the foundation of the houſe only can be traced, which was in the form of the letter L, in length 180 feet by 80 broad, and the foot of the letter 48 by 40; the area of the houſe containing 168,000 ſquare feet. It ſtood half a mile from the church, on the road to Shaſton, encompaſſed by a moat, now dry, in ſome places nine feet deep and 20 broad. The rampart appears to have been 30 feet thick. Here is a free ſchool, a large old building, and a workhouſe, as well as two ſtone bridges. In 1694, it received damage of near 4000l. by a fire. Near it is Gillingham foreſt, four miles long and one mile broad. The church is a large ancient fabric.

GILLINGHAM, a pariſh of Kent, three miles below Chatham, and on the ſame ſide of the Medway. Part of Chatham dock is in this pariſh; and here is a caſtle well furniſhed with guns that commands the river, there being no leſs than 170 embraſures for cannon; which would ſtop the progreſs of any enemy that ſhould happen to make way by Sheerneſs fort, before they could reach Chatham. Here are alſo copperas works. At this place 600 Norman gentlemen, who came over in the retinue of the two princes Alfred and Edward, were all barbarouſly murdered by Earl Godwin. It was in remote times the property of the archbiſhop of Canterbury, who had here an elegant palace, the old hall of which is now converted into a barn; it is built principally of flint, but the windows are filled up with brick. Near it are the remains of the chapel, &c. and a great part of the whole of its original outer walls may be traced.

GILOLO, a large iſland of the Pacific ocean, lying between 1° S. Lat. and 2° N. Lat. and between 125° and 128° E. Long. It belongs to the Dutch; but

Gilolo, Gilpin.

but does not produce any of the fine ſpices, though it lies in the neighbourhood of the ſpice iſlands. The natives are fierce and cruel ſavages.

GILPIN, BERNARD, rector of Houghton, diſtinguiſhed by his extraordinary piety and hoſpitality, was deſcended from an ancient and honourable family in Weſtmoreland, and born in 1517. As he was bred in the Catholic religion, ſo he for ſome time defended it againſt the reformers, and at Oxford held a diſputation with Hooper, afterward biſhop of Worceſter and a martyr for the Proteſtant faith; but was ſtaggered in another diſputation with Peter Martyr, and began ſeriouſly to examine the conteſted points by the beſt authorities. Thus, being preſented to the vicarage of Norton in the dioceſe of Durham, he ſoon reſigned it, and went abroad to conſult eminent profeſſors on both ſides; and after three years abſence returned a little before the death of Queen Mary, ſatisfied in the general doctrines of the reformation. He was kindly received by his uncle Dr Tonſtall, biſhop of Durham; who ſoon after gave him the archdeaconry of Durham, to which the rectory of Eſſington was annexed. When repairing to his pariſh, though the perſecution was then at its height, he boldly preached againſt the vices, errors, and corruptions of the times, eſpecially in the clergy, on which a charge conſiſting of 13 articles was drawn up againſt him, and preſented in form to the biſhop. But Dr Tonſtall found a method of diſmiſſing the cauſe in ſuch a manner as to protect his nephew, without endangering himſelf, and ſoon after preſented him to the rich living of Houghton le Spring. He was a ſecond time accuſed to the biſhop, and again protected; when his enemies, enraged at this ſecond defeat, laid their complaint before Dr Bonner, biſhop of London; who immediately gave orders to apprehend him. Upon which Mr Gilpin bravely prepared for martyrdom; and ordering his houſe ſteward to provide him a long garment that he might make a decent appearance at the ſtake, ſet out for London. Luckily, however, he broke his leg on the journey; which protracted his arrival until the news of the queen's death freed him from all further apprehenſions. Being immediatetly ſet at liberty, he returned to Houghton, where he was received by his pariſhioners with the ſincereſt joy.

Upon the deprivation of the Popiſh biſhops, he was offered the ſee of Carliſle, which he declined; and confining his attention to his rectory, diſcharged all the duties of his function in the moſt exemplary manner. To the greateſt humanity and courteſy, he added an unwearied application to the inſtruction of thoſe under his care. He was not ſatisfied with the advice he gave in public, but uſed to inſtruct in private; and brought his pariſhioners to come to him with their doubts and difficulties. He had a moſt engaging manner towards thoſe whom he thought well diſpoſed: nay, his very reproof was ſo conducted, that it ſeldom gave offence; the becoming gentleneſs with which it was urged made it always appear the effect of friendſhip. Thus, with unceaſing aſſiduity, did he employ himſelf in admoniſhing the vicious, and engaging the well-intentioned; by which means, in a few years, he made a greater change in his neighbourhood than could well have been imagined. A remarkable inſtance, what reformation a ſingle man may effect, when he hath it earneſtly at heart!

Gilpin.

But his hopes were not ſo much in the preſent generation, as in the ſucceeding. It was an eaſier taſk, he found, to prevent vice, than to correct it; to form the young to virtue, than to amend the bad habits of the old. He employed much of his time, therefore, in endeavouring to improve the minds of the younger part of his pariſh; ſuffering none to grow up in an ignorance of their duty; but preſſing it as the wiſeſt part to mix religion with their labour, and amidſt the cares of this life to have a conſtant eye upon the next. He attended to every thing which might be of ſervice to his pariſhioners. He was very aſſiduous in preventing all law ſuits among them. His hall is ſaid to have been often thronged with people, who came to him about their differences. He was not indeed much acquainted with law; but he could decide equitably, and that ſatisfied: nor could his ſovereign's commiſſion have given him more weight than his own character gave him.

His hoſpitable manner of living was the admiration of the whole country. He ſpent in his family every fortnight 40 buſhels of corn, 20 buſhels of malt, and a whole ox; beſides a proportionable quantity of other kinds of proviſion. Strangers and travellers found a cheerful reception. All were welcome that came; and even their beaſts had ſo much care taken of them, that it was humorouſly ſaid, "If a horſe was turned looſe in any part of the country, it would immediately make its way to the rector of Houghton's."

Every Sunday, from Michaelmas till Eaſter, was a ſort of public day with him. During this ſeaſon he expected to ſee all his pariſhioners and their families. For their reception, he had three tables well covered; the firſt was for gentlemen, the ſecond for huſbandmen and farmers, and the third for day labourers. This piece of hoſpitality he never omitted, even when loſſes, or a ſcarcity of proviſion, made its continuance rather difficult to him. He thought it his duty, and that was a deciding motive. Even when he was abſent from home, no alteration was made in his family expences; the poor were fed as uſual, and his neighbours entertained.

But notwithſtanding all his painful induſtry, and the large ſcope it had in ſo extended a pariſh, Mr Gilpin thought the ſphere of his benevolence yet too confined. It grieved him extremely to ſee everywhere, in the pariſhes around him, ſo great a degree of ignorance and ſuperſtition, occaſioned by the ſhameful neglect of the paſtoral care in the clergy of thoſe parts. Theſe bad conſequences induced him to ſupply, as far as he could, what was wanting in others. For this purpoſe, every year he uſed regularly to viſit the moſt neglected pariſhes in Northumberland, Yorkſhire, Cheſhire, Weſtmoreland, and Cumberland; and that his own pariſh in the mean time might not ſuffer, he was at the expence of a conſtant aſſiſtant. In each place he ſtaid two or three days; and his method was, to call the people about him, and lay before them, in as plain a way as poſſible, the danger of leading wicked or even careleſs lives; explaining to them the nature of true religion; inſtructing them in the duties they owed to God, their neighbour, and themſelves; and ſhowing them how greatly a moral and religious conduct would contribute to their preſent as well as future happineſs.

As Mr Gilpin had all the warmth of an enthuſiaſt, though

Gilpin. though under the direction of a very calm and ſober judgment, he never wanted an audience, even in the wildeſt parts; where he rouſed many to a ſenſe of religion, who had contracted the moſt inveterate habits of inattention to every thing of a ſerious nature. And wherever he came, he uſed to viſit all the gaols and places of confinement; few in the kingdom having at that time any appointed miniſter. And by his labours, and affectionate manner of behaving, he is ſaid to have reformed many very abandoned perſons in thoſe places. He would employ his intereſt likewiſe for ſuch criminals whoſe caſes he thought attended with any hard circumſtances, and often procured pardons for them.

There is a tract of country upon the border of Northumberland, called *Reads-dale* and *Tine-dale*, of all barbarous places in the north at that time the moſt barbarous. Before the Union, this place was called the *debateable land*, as ſubject by turns to England and Scotland, and the common theatre where the two nations were continually acting their bloody ſcenes. It was inhabited by a kind of deſperate banditti, rendered fierce and active by conſtant alarms: they lived by theft, uſed to plunder on both ſides of the barrier; and what they plundered on one, they expoſed to ſale on the other; by that means eſcaping juſtice. And in this dreadful country, where no man would even travel that could help it, Mr Gilpin never failed to ſpend ſome part of every year.

He generally choſe the Chriſtmas holidays for his journey, becauſe he found the people at that ſeaſon moſt diſengaged, and moſt eaſily aſſembled. He had ſet places for preaching, which were as regularly attended as the aſſize towns of a circuit. If he came where there was a church, he made uſe of it: if not, of barns, or any other large building; where great crowds of people were ſure to attend him, ſome for his inſtructions, and others for his charity. This was a very difficult and laborious employment. The country was ſo poor, that what proviſion he could get, extreme hunger only could make palatable. The inclemency of the weather, and the badneſs of the roads through a mountainous country, and at that ſeaſon covered with ſnow, expoſed him likewiſe often to great hardſhips. Sometimes he was overtaken by the night, the country being in many places deſolate for ſeveral miles together, and obliged to lodge out in the cold. At ſuch times, we are told, he would make his ſervant ride about with his horſes, whilſt himſelf on foot uſed as much exerciſe as his age and the fatigues of the preceding day would permit. All this he cheerfully underwent; eſteeming ſuch ſervices well compenſated by the advantages which he hoped might accrue from them to his uninſtructed fellow creatures.

The diſintereſted pains he took among theſe barbarous people, and the good offices he was always ready to do them, drew from them the warmeſt and ſincereſt expreſſions of gratitude. Indeed he was little leſs than adored among them, and might have brought the whole country almoſt to what he pleaſed. One inſtance that is related, ſhows how greatly he was revered. By the careleſſneſs of his ſervants, his horſes were one day ſtolen. The news was quickly propagated, and every one expreſſed the higheſt indignation at the fact. The thief was rejoicing over his prize, when, by the report of the country, he found whoſe horſes he had taken. Gilpin. Terrified at what he had done, he inſtantly came trembling back, confeſſed the fact, returned the horſes, and declared he believed the devil would have ſeized him directly, had he carried them off knowing them to have been Mr Gilpin's.

We have already taken notice of Mr Gilpin's uncommonly generous and hoſpitable manner of living. The value of his rectory was about 400l. a year: an income, indeed, at that time very conſiderable, but yet in appearance very diſproportionate to the generous things he did: indeed, he could not have done them, unleſs his frugality had been equal to his generoſity. His friends, therefore, could not but wonder to find him, amidſt his many great and continual expences, entertain the deſign of building and endowing a grammar ſchool: a deſign, however, which his exact economy ſoon enabled him to accompliſh, though the expence of it amounted to upwards of 500l. His ſchool was no ſooner opened, than it began to flouriſh; and there was ſo great a reſort of young people to it, that in a little time the town was not able to accommodate them. He put himſelf, therefore, to the inconvenience of fitting up a part of his own houſe for that purpoſe, where he ſeldom had fewer than 20 or 30 children. Some of theſe were the ſons of perſons of diſtinction, whom he boarded at eaſy rates: but the greater part were poor children, whom he not only educated, but clothed and maintained: he was at the expence likewiſe of boarding in the town many other poor children. He uſed to bring ſeveral every year from the different parts where he preached, particularly Reads-dale and Tine-dale; which places he was at great pains in civilizing, and contributed not a little towards rooting out that barbariſm which every year prevailed leſs among them.

As to his ſchool, he not only placed able maſters in it, whom he procured from Oxford, but himſelf likewiſe conſtantly inſpected it. And, that encouragement might quicken the application of his boys, he always took particular notice of the moſt forward: he would call them *his own ſcholars*, and would ſend for them often into his ſtudy, and there inſtruct them himſelf. One method uſed by him to fill his ſchool was a little ſingular. Whenever he met a poor boy upon the road, he would make trial of his capacity by a few queſtions, and if he found it ſuch as pleaſed him, he would provide for his education. And beſides thoſe whom he ſent from his own ſchool to the univerſities, and there wholly maintained, he would likewiſe give to others, who were in circumſtances to do ſomething for themſelves, what farther aſſiſtance they needed. By which means he induced may parents to allow their children a liberal education, who would otherwiſe not have done it. And Mr Gilpin did not think it enough to afford the means only of an academical education to theſe young people, but endeavoured to make it as beneficial to them as he could. He ſtill conſidered himſelf as their proper guardian; and ſeemed to think himſelf bound to the public for their being made uſeful members of it, as far as it lay in his power to make them ſo. With this view he held a punctual correſpondence with their tutors; and made the youths themſelves frequently write to him, and give him an account of their ſtudies. So ſolicitous indeed was he

about

Gilpin. about them, knowing the many temptations to which their age and ſituation expoſed them, that once every other year he generally made a journey to the univerſities to inſpect their behaviour. And this uncommon care was not unrewarded; for many of his ſcholars became ornaments to the church, and exemplary inſtances of piety.

To the account that hath been already given of Mr Gilpin's hoſpitality and benevolence, the following particulars may be added. Every Thurſday throughout the year, a very large quantity of meat was dreſſed wholly for the poor; and every day they had what quantity of broth they wanted. Twenty-four of the pooreſt were his conſtant penſioners. Four times in the year a dinner was provided for them; when they received from his ſteward a certain quantity of corn, and a ſum of money: and at Chriſtmas they had always an ox divided among them.

Whenever he heard of any in diſtreſs, whether of his own pariſh or any other, he was ſure to relieve them. In his walks abroad, he would frequently bring home with him poor people, and ſend them away clothed as well as fed. He took great pains to inform himſelf of the circumſtances of his neighbours, that the modeſty of the ſufferer might not prevent his relief. But the money beſt laid out was, in his opinion, that which encouraged induſtry. It was one of his greateſt pleaſures to make up the loſſes of his laborious neighbours, and prevent their ſinking under them. If a poor man had loſt a beaſt, he would ſend him another in its room: or if any farmer had had a bad year, he would make him an abatement in his tythes. Thus, as far as he was able, he took the misfortunes of his pariſh upon himſelf; and, like a true ſhepherd, expoſed himſelf for his flock. But of all kinds of induſtrious poor, he was moſt forward to aſſiſt thoſe who had large families; ſuch never failed to meet with his bounty, when they wanted to ſettle their children in the world.

In the diſtant pariſhes where he preached, as well as in his own neighbourhood, his generoſity and benevolence were continually ſhowing themſelves; particularly in the deſolate parts of Northumberland. "When he began his journey," ſays an old manuſcript life of him, "he would have 10 pounds in his purſe; and, at his coming home, he would be 20 nobles in debt, which he would always pay within a fortnight after." In the gaols he viſited, he was not only careful to give the priſoners proper inſtructions, but uſed to purchaſe for them likewiſe what neceſſaries they wanted.

Even upon the public road, he never let ſlip an opportunity of doing good. He has often been known to take off his cloak, and give it to a half-naked traveller: and when he has had ſcarce money enough in his pocket to provide himſelf a dinner, yet would he give away part of that little, or the whole, if he found any who ſeemed to ſtand in need of it. Of this benevolent temper, the following inſtance is preſerved. One day returning home he ſaw in a field ſeveral people crowding together; and judging ſomething more than ordinary had happened, he rode up, and found that one of the horſes in a team had ſuddenly dropped down, which they were endeavouring to raiſe; but in vain, for the horſe was dead. The owner of it ſeemed much dejected with his misfortune; and declaring how grievous a loſs it would be to him, Mr Gilpin bade him not be diſheartened: "I'll let you have (ſays he), honeſt man, that horſe of mine," and pointed to his ſervant's.—"Ah! maſter (replied the countryman), my pocket will not reach ſuch a beaſt as that." "Come, come (ſaid Mr Gilpin), take him, take him; and when I demand my money, then thou ſhalt pay me." Gilpin || Gingiro.

This worthy and excellent divine, who merited and obtained the glorious titles of *the Father of the Poor*, and the *Apoſtle of the North*, died in 1583, in the 66th year of his age.

GILTHEAD. See SPARUS, ICHTHYOLOGY *Index*.

GIN. See GENEVA.

GIN, in mechanics, a machine for driving piles, fitted with a windlaſs and winches at each end, where eight or nine men heave, and round which a rope is reeved that goes over the wheel at the top: one end of this rope is ſeized to an iron monkey, that hooks to a beetle, of different weights, according to the piles they are to drive, being from eight to thirteen hundred weight; and when hove up to a croſs piece, near the wheel, it unhooks the monkey, and lets the beetle fall on the upper end of the pile, and forces the ſame into the ground: then the monkey's own weight overhauls the windlaſs, in order for its being hooked again to the beetle.

GINGER, the root of a ſpecies of amomum. See AMOMUM, BOTANY *Index*.

GINGIDIUM, a genus of plants, belonging to the pentandria claſs. See BOTANY *Index*.

GINGIRO, or ZINDERO, a ſmall territory of Africa, to the ſouth of Abyſſinia; being ſeparated from it by the river Zebee, by which it is alſo almoſt entirely ſurrounded. This river is extremely large, having more water than the Nile, and being much more rapid; ſo that, during the rainy ſeaſon, it would be altogether impaſſable, were it not for the large rocks which are in its channel. The extreme difficulty which occurs in paſſing this river, however, is the means of preſerving the kingdom of Gingiro, which would otherwiſe be conquered in a ſingle ſeaſon by the Galla.

The moſt remarkable particular with regard to this kingdom is, that the ſovereign is a profeſſed votary of the devil. "This ſuperſtition (ſays Mr Bruce) reaches down all the weſtern ſide of the continent on the Atlantic ocean, in the countries of Congo, Angola, and Benin. In ſpite of the firmeſt foundation in true philoſophy, a traveller, who decides from the information and inveſtigation of facts, will find it very difficult to treat theſe appearances as abſolute fictions, or as owing to the ſuperiority of cunning of one man in overreaching another. For my own part, I confeſs, I am equally at a loſs to aſſign reaſons for diſbelieving the fiction on which their pretenſions to ſome preternatural information are founded, as to account for them by the operation of ordinary cauſes."

In this kingdom every thing is conducted, or pretended to be conducted, by magic; and all thoſe ſlaves, which in other African countries are ſold to Europeans, are here ſacrificed to the devil, human blood being a neceſſary part in all their accurſed ſolemnities. "How far (ſays Mr Bruce) this reaches to the ſouthward, I do not know; but I look upon this to be the geographical bounds of the reign of the devil.

Gingiro || Gioia.

devil on the north ſide of the equator in the peninſula of Africa."

With regard to this country, very little farther is known, than ſome of the cuſtoms of the people tranſiently picked up by the Jeſuit miſſionaries in Abyſſinia. From them we learn, that the kingdom is hereditary in one family, though it does not regularly deſcend to the eldeſt ſon, the king being choſen by the nobles; in which they reſemble their neighbours the Abyſſinians. When the king dies, his body is wrapped in a fine cloth, and a cow is killed. The body ſo wrapped up is next encloſed in the cow's ſkin; and all the princes of the royal family fly and hide themſelves in the buſhes, while thoſe who are intruſted with the election enter the thickets, beating about everywhere as if for game. At laſt a bird of prey, called in their language *liber*, appears, and hovers over the perſon deſtined to be king; crying and making a great noiſe without quitting his ſtation. By this means the perſon deſtined to be elected is found out, ſurrounded, as is reported, by lions, tigers, panthers, and other wild beaſts; all which are ſuppoſed to be brought by the power of magic or of the devil.—After the king is found, he flies upon thoſe who came in queſt of him with great fury, killing and wounding as many as he can reach, until at laſt he is dragged to the throne whether he will or not. One particular family have the privilege of conducting him to the throne; and if they ſhould not happen to find him at firſt, they have a right to take him out of the hands of thoſe who did ſo; and thus another battle enſues before the vacant throne can be filled. Laſtly, Before he enters his palace, two men muſt be killed; one at the foot of a tree by which the houſe is ſupported; and the other at the threſhold of the door, which is beſmeared with the blood of the victim. It is the particular privilege of one family to afford theſe victims; and ſo far are they from ſeeking to avoid this fate, that they glory in the occaſion, and willingly offer themſelves to meet it. This laſt particular, Mr Bruce ſays, he had in Abyſſinia from people coming from Gingiro.

GINGIVÆ, the gums. See GUMS.

GINGLYMUS, in *Anatomy*, one of the ſpecies of articulation. It is that jointure of the bones where each bone mutually receives the other; ſo that each bone both receives and is received. See ANATOMY *Index*.

GINKGO, the MAIDEN-HAIR TREE. See MAURITIA, BOTANY *Index*.

GINORA, a genus of plants belonging to the dodecandria claſs, and in the natural method ranking with thoſe of which the order is doubtful. See BOTANY *Index*.

GINSENG. See PANAX, BOTANY and MATERIA MEDICA *Index*.

GIOIA, FLAVIO, of Amalfi, in the kingdom of Naples, the celebrated mathematician; who, from his knowledge of the magnetic powers, invented the mariner's compaſs, by which the navigation of the Europeans was extended to the moſt diſtant regions of the globe: before this invention, navigation was confined to coaſting. The king of Naples being a younger branch of the royal family of France, he marked the north point with a fleur-de-lis, in compliment to that country. It is ſaid the Chineſe knew the compaſs long before; be this as it may, the Europeans are indebted to Gioia for this invaluable diſcovery. He flouriſhed A. D. 1300.

Gioia || Girders.

GIORDANA, LUCA. See JORDANO.

GIORGIONE, ſo called from his comely aſpect, was an illuſtrious Venetian painter, born in 1478. He received his firſt inſtructions from Giovanni Bellino; but ſtudying afterwards the works of Leonardo da Vinci, he ſoon ſurpaſſed them both, being the firſt among the Lombards who found out the admirable effects of ſtrong lights and ſhadows. Titian became his rival in this art; and was ſo careful in copying the life, that he excelled Giorgione in diſcovering the delicacies of nature, by tempering the boldneſs of his colouring. The moſt valuable piece of Giorgione in oil is that of Chriſt carrying his croſs, now in the church of San Rovo in Venice; where it is held in great veneration. He died of the plague young, in 1511.

GIRAFFE. See CERVUS, MAMMALIA *Index*.

GIRALD, BARRY, or *Giraldus Cambrenſis*. See BARRY.

GIRALDI, LILIO GREGORIO, an ingenious critic, and one of the moſt learned men that modern Italy has produced, was born at Ferrara in 1479. He was at Rome when it was plundered by the emperor Charles V.; and having thus loſt all he had, and being tormented by the gout, he ſtruggled through life with ill fortune and ill health. He wrote, nevertheleſs, 17 performances, which were collected and publiſhed at Baſil in 2 vols. folio in 1580, and at Leyden in 1696. Authors of the firſt rank have beſtowed the higheſt eulogies on Giraldus; particularly Caſaubon and Thuanus.

GIRALDI, *John Baptiſt Cintio*, an Italian poet of the ſame family with the foregoing Lilio, was born in 1504. He was ſecretary to the duke of Ferrara, and afterwards became profeſſor of rhetoric at Pavia. He died in 1573. His works, which conſiſt chiefly of tragedies, were collected and publiſhed at Venice by his ſon Celſo Giraldi, in 1583; and ſome ſcruple not to rank him among the beſt tragic writers Italy has produced.

GIRARDON, FRANCIS, a celebrated French architect and ſculptor, born at Troyes in 1627. Louis XIV. being informed of his great talents, ſent him to Rome with a penſion of 1000 crowns. At his return into France, he laboured for the royal palaces and the gardens of Verſailles and Trianon; where there are many of his works executed in bronze and in marble, from the deſigns of Charles le Brun. The mauſoleum of Cardinal de Richelieu, in the Sorbonne, and the equeſtrian ſtatue of Louis XIV. at the Place de Vendome, where the ſtatue and horſe are caſt in one piece, paſs for his moſt excellent performances. Girardon was profeſſor, rector, and chancellor, of the Academy of Painting and Sculpture; and had the poſt of inſpector general of all the works done in ſculpture. He died in 1715.

GIRDERS, in *Architecture*, the largeſt pieces of timber in a floor. Their ends are uſually faſtened into the ſummers, or breſt ſummers; and the joiſts are framed at one end to the girders.

By the ſtatute for rebuilding London, no girder is to

Girders || Girgenti.

to be leſs than ten inches into the wall, and their ends to be always laid in loam, &c.

GIRDLE (*Cingulus* or *Zona*), a belt or band of leather or other matter, tied about the reins, to keep that part more firm and tight.

It was anciently the cuſtom for bankrupts and other inſolvent debtors to put off and ſurrender their girdle in open court. The reaſon of this was, that our anceſtors uſed to carry all their neceſſary utenſils, as purſe, keys, &c. tied to the girdle; whence the girdle became a ſymbol of the ſtate. Hiſtory relates that the widow of Philip I. duke of Burgundy, renounced her right of ſucceſſion by putting off her girdle upon the duke's tomb.

The Romans always wore a girdle to tuck up the tunica when they had occaſion to do any thing: this cuſtom was ſo general, that ſuch as went without girdles, and let their gowns hang looſe, were reputed idle diſſolute perſons.

Maiden's or *Virgin's* GIRDLE. It was a cuſtom among the Greeks and Romans for the huſband to untie his bride's girdle. Homer, lib. xi. of his Odyſſey, calls the girdle παρθενιην ζωνην, *maid's girdle*. Feſtus relates, that it was made of ſheep's wool, and that the huſband untied it in bed; he adds, that it was tied in the Herculanean knot; and that the huſband unlooſed it, as a happy preſage of his having as many children as Hercules, who at his death left ſeventy behind him.

The poets attribute to Venus a particular kind of girdle called *ceſtus*, to which they annexed a faculty of inſpiring the paſſion of love.

GIRGASHITES, or GERGESENES, an ancient people of the land of Canaan, whoſe habitation was beyond the ſea of Tiberias, where we find ſome footſteps of their name in the city of *Gergeſa*, upon the lake of Tiberias. The Jewiſh doctors inform us, that when Joſhua firſt came into the land of Canaan, the Girgaſhites took a reſolution rather to forſake their country than ſubmit to the Hebrews, and accordingly retired into Africa. Nevertheleſs, it is certain that a good number of them ſtaid behind, ſince Joſhua (xxiv. 11.) informs us that he ſubdued the Girgaſhites, and they whom he overcame were certainly on this ſide Jordan.

GIRGENTI, a town of Sicily, which occupies part of the ſite of the ancient *Agrigentum*. It has only one ſtreet fit for carriages. It is inhabited by 15,000 perſons; but has no remarkable buildings or works of art that deſerve mention: the only antiquities to be ſeen were a Latin inſcription of the time of the Antonines, as is pretended, relative to ſome aſſociation between Agrigentum and Lilybæum; and a piece of ancient maſonry in the foundations of a church pretended to be the remains of a temple of Jupiter. At ſome diſtance, on the old ground in the vale, ſtands the cathedral, a clumſy building patched up by barbarous architects with various diſcordant parts. This church is enriched with no works of modern painters or ſculptors that claim any title to praiſe, but the baptiſmal font is made out of an ancient ſarcophagus faced with very beautiful baſſo relievos. This ſee is the richeſt in Sicily, but has the character of being leſs enlightened and poliſhed than the reſt of the iſland. Among the curioſities belonging to the cathedral is an Etruſcan vaſe of rare ſize and preſervation. There are alſo ſome golden pateras of extreme rarity. The monaſtery of San Nicolo ſtands on a little eminence in the centre of the old city, admirably ſituated. The range of hills towards the ſouth-eaſt ſinks gradually, ſo as to admit a noble reach of ſea and of plain, terminated on each ſide by thick groves of fruit trees. Above appear the remains of ancient grandeur, wonderfully contraſted with the humble ſtraw cottages built at their feet. In the orchard of this convent is a ſquare building with pilaſters, which is ſuppoſed to have been part of the palace of the Roman prætor.

Girgenti || Giſborough.

Girgenti has the convenience of a port; for which, however, it is leſs indebted to its natural ſituation than to the recent aſſiſtance of art. The harbour is formed by means of a pier carried out in three ſides of an octagon, with a battery at the head; the light-houſe is to be erected on the cliffs on ſhore, as there is no poſſibility of raiſing it high enough on the mole without danger of ſinking. The work is admirable as to ſtrength and neatneſs, but the intention of creating a ſafe and complete haven has not been fully anſwered; the Sirocco commands it entirely, and drives in great quantities of ſand, which it is feared will in time choke up the port; even now ſhips of burden find it difficult to get in, but the Caricatore is conſiderable, and the magazines in the rocks along the ſhore are very ſpacious.

GIRONNE, or GIRONNY, in *Heraldry*, a coat of arms divided into girons, or triangular figures, meeting in the centre of the ſhield, and alternately colour and metal.

GIRT, the ſituation of a ſhip which is moored ſo ſtrait by her cables, extending from the *hawſe* to two diſtant anchors, as to be prevented from ſwinging or turning about according to any change of the wind or tide, to the current of which her head would otherwiſe be directed. The cables are extended in this manner, by a ſtrong application of mechanical powers within the ſhip; ſo that when ſhe veers, or endeavours to ſwing about, her ſide bears upon one of the cables, which catches on her heel, and interrupts her in the act of traverſing. In this poſition ſhe muſt ride with her broadſide to the wind or current, till one or both of the cables are ſlackened.

GISCO, ſon of Himilco the Carthaginian general, was baniſhed from Carthage by the influence of his enemies. Being afterwards recalled, he was made general in Sicily againſt the Corinthians, about 309 years before the Chriſtian era, and by his ſucceſs and intrepidity he obliged the enemies of his country to ſue for peace. See CARTHAGE.

GISBOROUGH, a town of England, in the weſt riding of Yorkſhire, on the road from Whitby to Durham, 224 miles from London, and four miles from the mouth of the Tees, where is a bay and harbour for ſhips. It had formerly an abbey, which was once the common burial place of the nobility of theſe parts, and its church by the ruins ſeems to have been equal to the beſt cathedrals in England. The ſoil, beſides its fertility in paſture and a conſtant verdure adorned with plenty of field flowers almoſt all the year, has earths of ſundry colours, ſome iron, and mines of alum, which were firſt diſcovered in the reign of King James I. and have been ſince very much improved. Sir Paul

Gifborough || Glaciers.

Pindar, who firſt farmed them, paid rents to the king 12,500l. to the Earl Muſgrave 1640l. and to Sir William Penniman 600l. and had moreover 800 men by ſea and land in conſtant pay; yet he was a conſiderable gainer, becauſe there was then ſcarce any other to be had, and the price was 26l. a ton; but now there are ſeveral other alum works in this county, which have taken a great part of the trade from hence; ſo that the works here have for ſome years lain neglected.

GITTITH, a Hebrew word occurring frequently in the Pſalms, and generally tranſlated *wine preſſes*. The conjectures of interpreters are various concerning this word. Some think it ſignifies a ſort of muſical inſtrument; others, that the pſalms with this title were ſung after the vintage; laſtly, others, that the hymns of this kind were invented in the city of Gath. Calmet is rather of opinion, that it was given to the claſs of young women or ſongſtreſſes of Gath to be ſung by them, Pſal. viii. 1. lxxxi. 1. lxxxiv. 1. Dr Hammond thinks that the pſalms with this title were all ſet to the ſame tune, and made on Goliath the Gittite.

GIULA, a ſtrong town of Upper Hungary, on the frontiers of Tranſylvania. It was taken by the Turks in 1566, and retaken by the Imperialiſts in 1695. It is ſeated on the river Kereſblan, in E. Long. 21. 1. N. Lat. 46. 25.

GIUSTANDEL, a large and ſtrong town of Turkey in Europe, and in Macedonia, with a Greek archbiſhop's ſee. It is ſeated near the lake Ochrida, in E. Long. 20. 50. N. Lat. 41. 10.

GLACIERS, a name given to ſome very extenſive fields of ice among the ALPS. Mr Coxe obſerves of theſe mountains in general, that they are compoſed of many parallel chains, the higheſt of which occupy the centre, and the others gradually diminiſh in proportion as we recede from thence. The central chain appears covered with pointed rocks; all parts of which, that are not abſolutely perpendicular, lie hid under perpetual ſnow and ice even in ſummer. On each ſide of this ridge are fertile and cultivated valleys, interſperſed with numerous villages, and watered by numerous ſtreams. The elevated peaks of the central chain are covered with ſnow: but their declivities, excepting thoſe that are extremely ſteep, have all a covering of ice as well as ſnow; the intermediate parts being filled with vaſt fields of ice, terminating in the cultivated valleys above mentioned. The ſame phenomena, though on a ſmaller ſcale, occur in thoſe chains that are at a diſtance from the principal one: In thoſe which are moſt remote, no ice, and ſcarcely any ſnow, is obſerved, unleſs upon ſome of the moſt elevated ſummits; and the mountains diminiſhing in height and ruggedneſs, appear covered with verdure, until at laſt they terminate in ſmall hills and plains.

Thus the glaciers may be divided into two ſorts; one occupying the deep valleys ſituated in the boſom of the Alps, and diſtinguiſhed by the name of Ice valleys; the others are thoſe which clothe the declivities and ſides of the mountains. Theſe two kinds of glaciers are diſtinguiſhed by Mr Coxe into the upper and lower glaciers.

The lower glaciers are by far the moſt conſiderable; ſome of them extending ſeveral leagues in length. They do not communicate with each other, as has been generally ſuppoſed, few of them being parallel to the central chain; but, ſtretching moſtly in a tranſverſe direction, are bordered at the higher extremity by inacceſſible rocks, and at the lower extending into the cultivated valleys. The thickneſs of the ice varies in different parts. In the glacier des Bois, which extends more than 15 miles in length, and upwards of three in breadth, M. Sauſſure found it generally from 80 to 100 feet; but he was credibly informed, that in ſome places it was not leſs than 600 feet, and even more. Theſe vaſt maſſes of ice uſually reſt on an inclined plane; where, being puſhed forward by their own weight, and but weakly ſupported by the rugged rocks beneath them, they are interſected by large crevices, and have an appearance of walls, pyramids, &c. according to the poſition of the eye in viewing them. In thoſe parts, however, where they lie upon even ground, or ſuch as has only a gentle inclination, the ſurface of the ice is nearly uniform, the crevices being few and narrow, and the glacier being croſſed by travellers on foot without any difficulty. The ſurface of the ice is rough and granulated, ſo that people may walk upon it, excepting ſuch places as have a ſteep deſcent. It is opaque, full of ſmall bubbles about the ſize of a pea, very porous, and greatly reſembles a mixture of ſnow and water congealed. A vaſt quantity of ſtones and earth falls down from the mountains upon the glaciers, and are by them thrown off on each ſide according to the deſcent of the ice, as will be afterwards explained. The place on which theſe reſt is more hard and elevated than the reſt of the ice, and is very difficult to walk upon; the earth is likewiſe laid upon them in ſuch regular heaps, that it appears to have been done by art. This collection of earth and ſtones is termed by the natives the *Moraine*.

Glaciers.

Mr Coxe, who viſited the glacier des Bois, informs us, that the appearance of it at a diſtance was ſo tremendous, that it ſeemed impracticable to croſs it. Numerous and broad chaſms interſected it in every direction; but entering upon it, the company found that courage and activity were only required to accompliſh the taſk. They had large nails in their ſhoes, and ſpiked ſticks; which on this occaſion were found to be particularly ſerviceable. Having paſſed the moraine, and deſcended upon the glacier itſelf, they found the ice ſoftened by a warm wind which rendered it leſs ſlippery than uſual. Having walked acroſs it for about a quarter of an hour, they came again to the moraine, along which they continued their journey for half an hour, and then entered upon the great body of the glacier. "Here (ſays Mr Coxe) it was curious to obſerve the numerous little rills produced by the collection of drops occaſioned by the thawing of the ice on the upper part of the glacier: theſe little rills hollow out ſmall channels, and, torrent-like, precipitate themſelves into the chaſms with a violent noiſe, increaſing the body of waters formed by the melting of the interior ſurface, and finding an outlet under the immenſe arch of ice in the valley of Chamouni, from which the Arveron ruſhes." As our traveller proceeded on his journey, he was ſurpriſed by the noiſe of a large fragment of rock which had detached itſelf from one of the higheſt needles, and bounded from one precipice to another with great rapidity; but before it reached the plain, it was almoſt reduced to duſt. "Having proceeded about an hour

(ſays,

Glaciers. (ſays he) we were aſtoniſhed with a view more magnificent than imagination can conceive: hitherto the glaciers had ſcarcely anſwered my expectations, but now they far ſurpaſſed them. Nature had clad herſelf in all her terrors. Before us was a valley of ice 20 miles in extent, bounded by a circular glacier of pure unbroken ſnow, named Takul, which leads directly to the foot of Mount Blanc, and is ſurrounded by large conical rocks, terminating in ſharp points like the towers on an ancient fortification; to the right roſe a range of magnificent peaks, the intervals filled with glaciers; and far above the reſt, the magnificent ſummit of Mount Blanc, his higheſt point obſcured with clouds. He appeared of ſuch immenſe magnitude, that, at his preſence, the circumjacent mountains, however gigantic, ſeemed to ſhrink before him, and *hide their diminiſhed heads*. In half an hour we arrived at the moraine, which forms a boundary of the valley, croſſed it, and proceeded upon a body of ice about three quarters of a mile broad. Here the ice was more even and free from chaſms than in the great valley. We then paſſed a ſecond moraine, and beyond that another maſs of ice to a third moraine: deſcending from thence we came upon the laſt ridge of ice, broader conſiderably than the two former, and full of large chaſms: it is ſeparated from the rock only by a very narrow moraine. Theſe moraines contain great quantities of cryſtal."

They continued to aſcend the valley of ice, the ſcene conſtantly increaſing in magnificence and horror; and having walked about five miles on the ice, they arrived at laſt at the foot of the eminence named *Couvercle*, where they were obliged to quit the ice. The doing this was extremely dangerous, and at one place very tremendous. It was a bulging ſmooth rock, with a precipice of conſiderable depth terminated by a vaſt crevice in the ice, which ſeemed to ſtop all further progreſs: a ſmall hollow in the middle, however, afforded room for one foot; and having fixed this, they ſprung over to the other ſide, being helped and directed by the guides who went over firſt. Having gained the top of the Couvercle, they had a view of three of the glaciers, viz. that of *Talefre* to the left, *l' Echaut* in front, and *Takul* on the right; all uniting in that great one called the *Glacier de Bois*. The Couvercle itſelf is a moſt extraordinary rock, having the appearance of a large irregular building with many ſides; the ſubſtance of which is granite. Having reached the top, they were ſurpriſed with a thunder ſtorm, from which they took ſhelter under an impending rock. The view was exceedingly magnificent; the glaciers appearing like a rugged expanſe of frozen ſea bounded by gigantic rocks, and terminated by Mount Blanc. A ſingle rock appeared of a triangular figure covered with Alpine plants; and which by reaſon of its contraſt with the rugged and ſnowy mountains in the neighbourhood, has obtained the name of the *Garden*. During this, as well as other excurſions among the Alps, Mr Coxe had occaſion to obſerve that the colour of the ſky was of a much deeper blue than in the lower regions.

The upper glaciers may be ſubdivided into thoſe which cover the ſummits, and thoſe which extend along the ſides of the Alps. Thoſe on the very ſummit, however, though they have the appearance of ice, are not ſo in reality, but conſiſt entirely of ſnow hardened by the extreme cold. M. Sauſſure found that which covered the top of Mount Blanc to be penetrable, though with difficulty, by a ſtick; but below this hard cruſt was a ſoft ſnow without coherence. The ſides are covered with a mixture of ice and ſnow; by reaſon of the ſuperior power of the ſummer ſun to diſſolve the ſnow which afterwards congeals into hard ice. Glaciers.

Several conjectures have been made concerning the formation of theſe extraordinary bodies of ice. Mr Coxe agrees with M. Gruner in opinion, that they are produced by the continual diſſolution of the ſnow in ſummer, and its congelation by the ſucceeding froſts. Hence, on the ſummits of the mountains where the ſun has very little power, the glacier is ſoft, and contains no ice: as we deſcend the mountains the conſiſtence becomes firmer, becauſe there is a conſiderable mixture of ſnow water, the congelation of which augments the hardneſs; and in the valleys, the glacier is hardeſt of all, becauſe the portion of water is there much ſuperior to that of the ſnow. Hence it ſeems plain that the glaciers derive their origin from the melting of the ſnow on the upper parts of the mountains, and the congelation of the water as it advances: and to this cauſe M. Sauſſure adds the quantity of ſnow which often rolls down into the valleys, and congeals along with the water juſt mentioned.

Another queſtion concerning the glaciers naturally occurs, namely, Whether they are to be conſidered as in a ſtate of increaſe or diminution? Mr Coxe is of opinion, that they occaſionally increaſe and decreaſe; in proof of which he adduces the following obſervation: "The borders of the glacier of Montanvert are moſtly ſkirted with trees: towards its baſe a vaſt arch of ice riſes to near 100 feet in height; under which the river Arveron ruſhes with conſiderable force, and in a large body of water. As we approached the ice, we paſſed through a wood of firs: thoſe trees which ſtand at a little diſtance from the arch are about 80 feet high and are undoubtedly of a very great age. Between theſe and the glacier the trees are of a later growth; as is evident from their texture and inferior ſize. Others, ſtill ſmaller, have been overturned and enveloped in the ice: there ſeems to be a kind of regular gradation in the age of theſe ſeveral trees, from the largeſt which are ſtanding to the ſmalleſt that lie proſtrate."—Hence our author concludes, that the glacier once extended as far as the row of ſmall firs; but that upon its gradual diſſolution, a number of trees ſhot up on the ſpot it had occupied; ſince which time the ice has again advanced, and overturned the laſt grown trees before they had attained to any conſiderable height.—This he thinks alſo confirmed by the following fact.—"Large ſtones of granite are uſually found at a ſmall diſtance from the extremities of the glacier. Theſe ſtones have certainly fallen from the mountains upon the ice; have been carried on in its progreſs; and have tumbled into the plain upon the diſſolution or ſinking of the ice which ſupported them. Theſe ſtones, which the natives call *Moraine*, form a kind of border towards the foot of the valley of ice, and have been puſhed forward by the glacier in its advances: they extend even to the place occupied by the larger pines."

In oppoſition to thoſe who maintain that there is a conſtant accumulation of ice and ſnow in the Alpine regions, our author makes the following remarks: 1. Between the years 1776 and 1785 the glacier of

Glaciers. Grindelevald had diminiſhed to ſuch a degree, that the ſpot which its extremity occupied in the former year, was at leaſt 400 paces from that occupied by it in the latter. 2. In the year 1785 the Murailles de Glace, which in 1776 he had deſcribed as forming the border of the glacier of Boſſon no longer exiſted; and young trees had ſhot up in the parts which were then covered by the glacier of Montanvert. Still, however, it may be urged, that theſe changes only take place in the valleys where the power of the ſun is conſiderable; and that from thence we cannot form any adequate idea of what paſſes in the more elevated regions, where in all probability more ſnow falls than can be diſſolved. In ſupport of this opinion, it is alleged, that the cold produced by the maſs of ice already formed ought to augment it ſtill more; and that within the memory of the preſent generation, many places have been covered with ice which were not ſo before. To theſe arguments, however, Mr Coxe replies, that the cauſes, which diminiſh the ice in the upper regions, are no leſs powerful than the cold which tends to augment it. Theſe are, 1. Rain or ſleet; which falling upon the lower glaciers, thaw the ice, increaſe the rills on its ſurface, excavate channels, and in many ways tend to diminiſh its quantity. 2. Evaporation, which takes place even from the ſurface of the ice itſelf, acts ſtill more powerfully; and its action is not confined to any particular ſeaſon. 3. The falling of the ſnow and ice; both that which comes gradually from the clouds; and that which deſcends from the mountains in great maſſes, called by the natives *avalanches*. When theſe laſt fall down into milder regions, though ſometimes they may reſiſt the influence of the ſun and form ice valleys, yet they generally diſſolve. They are moſt common in the upper glaciers, though ſometimes they deſcend upon the lower, while the gradual deſcent of ſnow from the clouds, which chiefly takes place in the lower, contributes very much to leſſen the maſs. 4. All the lower glaciers or valleys of ice reſt on an inclined plane, are hollow, and undermined by torrents which are conſtantly flowing from the upper glaciers, as well as from their own lowermoſt ſurface. Their foundation being thus conſtantly diminiſhing, the lower glaciers are carried imperceptibly forward into the cultivated fields, where an end is neceſſarily put to their progreſs by the heat of the ſun. Hence we may ſee the reaſon of that ſtrange phenomenon taken notice of by Mr Coxe, that with one hand he could touch ripe corn, and with the other ſolid ice. This deſcent of the glacier is demonſtrable from the trees overturned by it, and the moraine always obſerved at the bottom of the lower glaciers. 5. The heat of the ſun is an evident cauſe of the diminution of the glaciers. To this Mr Coxe adds another cauſe leſs generally known, viz. the warm winds which blow by night as well as by day both in the upper and lower glaciers. "Theſe warm winds (ſays he) are during ſummer ſo common in thoſe parts, that I never croſſed a glacier without feeling in ſome particular poſitions a warmth ſimilar to the air of a hot bath." 6. Another cauſe is the mean temperature of the earth itſelf; which, where it is not expoſed to the piercing cold of the atmoſphere, is found to have a temperature always above the freezing point. As the vaſt thickneſs of the ſuperincumbent ice, therefore, is in the preſent caſe abundantly ſufficient to prevent the acceſs of the atmoſphere, it is plain that the lower ſurface of it muſt, by being in contact with the earth, continually decay.— With regard to the other argument drawn from the known increaſe of the ice in ſome places, Mr Coxe does not deny it; but inſiſts, that there is no continual increaſe of the whole, but that if it increaſes in ſome places, it diminiſhes in others; and his opinion in this reſpect was confirmed by thoſe who frequent the mountains. Glaciers || Gladiators.

GLACIS, in building, an eaſy inſenſible ſlope or declivity.

The deſcent of the glacis is leſs ſteep than that of the talus. In gardening, a deſcent ſometimes begins in talus, and ends in glacis.

The glacis of the corniche, is an eaſy imperceptible ſlope in the cymatium, to promote the deſcent and draining off the rain water.

GLACIS, in *Fortification*, that maſs of earth which ſerves as a parapet to the covered way, ſloping eaſily towards the champaign or field.

GLADE, in *Gardening* and *Agriculture*, an opening and light paſſage made through a wood, by lopping off the branches or trees along that way.

GLADIATORS, in antiquity, perſons who fought, generally in the arena at Rome, for the entertainment of the people.

The gladiators were uſually ſlaves, and fought out of neceſſity; though ſometimes freemen made profeſſion thereof, like our prize-fighters, for a livelihood.

The Romans borrowed this cruel diverſion from the Aſiatics: ſome ſuppoſe that there was policy in the practice, the frequent combats of gladiators tending to accuſtom the people to deſpiſe dangers and death.

The origin of ſuch combats ſeems to be as follows: From the earlieſt times with which we have any acquaintance in profane hiſtory, it had been the cuſtom to ſacrifice captives, or priſoners of war, to the manes of the great men who had died in the engagement; thus Achilles, in the Iliad, lib. xxiii. ſacrifices twelve young Trojans to the manes of Patroclus; and in Virgil, lib. xi. ver. 81. Æneas ſends captives to Evander, to be ſacrificed at the funeral of his ſon Pallas.

In courſe of time they came alſo to ſacrifice ſlaves at the funerals of all perſons of condition: this was even eſteemed a neceſſary part of the ceremony; but as it would have appeared barbarous to have maſſacred them like beaſts, they were appointed to fight with each other, and endeavour to ſave their own lives by killing their adverſary. This ſeemed ſomewhat leſs inhuman, becauſe there was a poſſibility of avoiding death, by an exertion of ſkill and courage.

This occaſioned the profeſſion of gladiator to become an art: hence aroſe maſters of the art, and men learned to fight and exerciſe. Theſe maſters, whom the Latins called *laniſtæ*, bought them ſlaves to be trained up to this cruel trade, whom they afterwards ſold to ſuch as had occaſion to preſent the people with ſo horrible a ſhow.

Theſe exhibitions were at firſt performed near the ſepulchre of the deceaſed, or about the funeral pile; but were afterwards removed to the circus and amphitheatres, and became ordinary amuſements.

The firſt ſhow of gladiators, called *munus gladiatorium*, was exhibited at Rome, according to Valerius Maximus, by

Gladiators. by M. and D. Brutus, upon the death of their father, in the year of the city 490. On this occaſion there were probably only three pair of gladiators. In 537 the three ſons of M. Æmilius Lepidus the augur, who had been three times conſul, entertained the people with the cruel pleaſure of ſeeing 22 gladiators fight in the forum. In 547, the firſt Africanus diverted his army at New Carthage with a ſhow of gladiators, which he exhibited in honour of his father and uncle, who had begun the reduction of Spain. In proceſs of time, the Romans became ſo fond of theſe bloody entertainments, that not only the heir of any great and rich citizen lately deceaſed, but all the principal magiſtrates, preſented the people with ſhows of this nature, to procure their affection. The ædiles, prætors, conſuls, and, above all, the candidates for offices, made their court to the people, by entertaining them frequently with theſe fights: and the prieſts were ſometimes the exhibitors of the barbarous ſhows; for we meet with the *ludi pontificales* in Suetonius, Auguſt. cap. 44. and with the *ludi ſacerdotales*, in Pliny, Epiſt. lib. vii. As for the emperors, it was ſo much their intereſt to ingratiate themſelves with the populace, that they obliged them with combats of gladiators almoſt upon all occaſions; and as theſe increaſed, the number of combatants increaſed likewiſe. Accordingly, Julius Cæſar, in his ædileſhip, diverted the people with 320 couple. Titus exhibited a ſhow of gladiators, wild beaſts, and repreſentations of ſea fights, which laſted 100 days; and Trajan continued a ſolemnity of this nature for 123 days; during which time he brought out 1000 pair of gladiators. Before this time, under the republic, the number of gladiators was ſo great, that when the conſpiracy of Catiline broke out, the ſenate ordered them to be diſperſed into the garriſons and ſecured, leſt they ſhould have joined the diſaffected party. See *GLADIATORS War*.

Theſe ſports were become ſo common, and their conſequences in a variety of reſpects ſo dangerous, that Cicero preferred a law that no perſon ſhould exhibit a ſhow of gladiators within two years before he appeared candidate for any office. Julius Cæſar ordered, that only a certain number of men of this profeſſion ſhould be in Rome at a time; Auguſtus decreed, that only two ſhows of gladiators ſhould be preſented in a year, and never above ſixty couple of combatants in a ſhow; and Tiberius provided by an order of ſenate, that no perſon ſhould have the privilege of gratifying the people with ſuch a ſolemnity unleſs he was worth 400,000 ſeſterces. They were alſo conſiderably regulated by Nerva.

The emperor Claudius reſtrained them to certain occaſions; but he ſoon afterwards annulled what he decreed, and private perſons began to exhibit them at pleaſure as uſual; and ſome carried the brutal ſatisfaction ſo far as to have them at their ordinary feaſts. And not ſlaves only, but other perſons, would hire themſelves to this infamous office.

The maſter of the gladiators made them all firſt ſwear that they would fight to death; and, if they failed, they were put to death either by fire, or ſwords, clubs, whips, or the like.

It was a crime for the wretches to complain when they were wounded, or to aſk for death or ſeek to avoid it when overcome; but it was uſual for the emperor or the people to grant them life when they gave Gladiators. no ſigns of fear, but waited the fatal ſtroke with courage and intrepidity: Auguſtus even decreed that it ſhould always be granted them.

From ſlaves and freemen the inhuman ſport at length ſpread to people of rank and condition; ſo that Auguſtus was obliged to iſſue a public edict that none of the ſenatorian order ſhould become gladiators; and ſoon after he laid the ſame conſtraint on the knights: nevertheleſs Nero is related to have brought upwards of 400 ſenators and 600 Roman knights upon the arena; though Lipſius takes both theſe numbers to be falſified, and not without reaſon reduces them to 40 ſenators and 60 knights: yet Domitian, that other monſter of cruelty, refined upon Nero, exhibiting combats of women in the night time.

Conſtantine the Great is ſaid to have firſt prohibited the combats of gladiators in the Eaſt. At leaſt he forbade thoſe who were condemned to death for their crimes to be employed; there being an order ſtill extant to the *præfectus prætorii* rather to ſend them to work in the mines in lieu thereof: it is dated at Berytus in Phœnicia, the firſt of October 325.

The emperor Honorius forbade them at Rome on occaſion of the death of Telemachus, who coming out of the Eaſt into Rome at the time of one of theſe ſpectacles, went down into the arena, and uſed all his endeavours to prevent the gladiators from continuing the ſport; upon which the ſpectators of that carnage, fired with anger, ſtoned him to death. It muſt be obſerved, however, that the practice was not entirely aboliſhed, in the Weſt before Theodoric king of the Oſtrogoths. Honorius, on the occaſion firſt mentioned, had prohibited them; but the prohibition does not ſeem to have been executed. Theodoric, in the year 500, aboliſhed them finally.

Some time before the day of combat, the perſon who preſented the people with the ſhows gave them notice thereof by programmas or bills, containing the names of the gladiators, and the marks whereby they were to be diſtinguiſhed: for each had his ſeveral badge; which was moſt commonly a peacock's feather, as appears from the ſcholiaſt of Juvenal on the 158th verſe of the third ſatire, and Turnebus Adverſ. lib. ii. cap. 8. They alſo gave notice how long the ſhows would laſt, and how many couples of gladiators there were; and it even appears, from the 52d verſe of the ſeventh ſatire of the ſecond book of Horace, that they ſometimes made repreſentations of theſe things in painting, as is practiſed among us by thoſe who have any thing to ſhow at fairs.

The day being come, they began the entertainment by bringing two kinds of weapons; the firſt were ſtaves or wooden foils, called *rudes*; and the ſecond were effective weapons, as ſwords, poniards, &c. The firſt were called *arma luſoria*, or *exercitoria*; the ſecond *decretoria*, as being given by decree or ſentence of the prætor, or of him at whoſe expence the ſpectacle was exhibited. They began to fence or ſkirmiſh with the firſt, which was to be the prelude to the battle; and from theſe, when well warmed, they advanced to the ſecond at the ſound of the trumpets, with which they fought naked. Then they were ſaid *vertere arma*. The terms of ſtriking were *petere et repetere*; of avoiding a blow, *exire*;

and

Gladiators. and when one of the combatants received a remarkable wound, his adverſary or the people cried out, *Habet*, or *Hoc habet*. The firſt part of the engagement was called *ventilare, præludere;* and the ſecond, *dimicare ad certum*, or *verſis armis pugnare:* and ſome authors think, with much probability, that it is to theſe two kinds of combat that St Paul alludes in the paſſage 1 Cor. ix. 26, 27. "I fight not as one that beateth the air; but I keep my body, and bring it into ſubjection."

If the vanquiſhed ſurrendered his arms, it was not in the victor's power to grant him life; it was the people during the time of the republic, and the prince or people during the time of the empire, that were alone empowered to grant the boon. The reward of the conqueror was a branch of palm tree, and a ſum of money, probably collected among the ſpectators: ſometimes they gave him his congé, or diſmiſſed him by putting one of the wooden foils or *rudes* in his hand; and ſometimes they even gave him his freedom, putting the pilæus on his head. The ſign or indication, whereby the ſpectators ſhowed that they granted the favour, was *premere pollicem*, which M. Dacier takes to be a clenching of the fingers of both hands between one another, and ſo holding the two thumbs upright cloſe together; and, when they would have the combat finiſhed and the vanquiſhed ſlain, *verterunt pollicem*, they bent back the thumb; which we learn from Juvenal, Sat. iii. ver. 36. The gladiators challenged or defied each other, by ſhowing the little finger; and, by extending this, or ſome other, during the combat, they owned themſelves vanquiſhed, and begged mercy from the people: *Victi oſtenſam digiti venium à populo poſtulabant*, ſays the old ſcholiaſt on Perſius.

There were various kinds of gladiators, diſtinguiſhed by their weapons, manner, and time of fighting, &c. as, The *andabatæ*, mentioned under ANDABATÆ. The *catervarii*, who always fought in troops or companies, number againſt number; or, according to others, who fought promiſcuouſly, without any certain order. The *dimachæ*, who fought armed with two poniards or ſwords, or with ſword and dagger. The *eſſedarii*, who fought in cars. The *ſiſcales*, or *Cæſariani*, who belonged to the emperor's company; and who, being more robuſt and dexterous than the reſt, were frequently called for, and therefore named alſo *poſtulatitii*. Several other kinds are mentioned in the ancient authors.

GLADIATORS War (bellum Gladiatorium or *Spartacum)*, called alſo the *ſervile war*, was a war which the Romans ſuſtained about the year of their city 680. Spartacus, Crinus, and Oenomaus, having eſcaped, with other gladiators to the number of ſeventy-four, out of the place where they had been kept at Capua, gathered together a body of ſlaves, put themſelves at their head, rendered themſelves maſters of all Campania, and gained ſeveral victories over the Roman prætors. At length they were defeated in the year 682, at the extremity of Italy; having, in vain, attempted to paſs over into Sicily.

This war proved very formidable to the Romans. Craſſus was not able to finiſh it: the great Pompey was forced to be ſent as general.

The Dying GLADIATOR, a moſt valuable monument of ancient ſculpture, which is now preſerved in the palace of Chighi. This man, when he had received the mortal ſtroke, is particularly careful *ut procumbat honeſtè*, "that he might fall honourably." He is ſeated in a reclining poſture on the ground, and has juſt ſtrength ſufficient to ſupport himſelf on his right arm: and in his expiring moments it is plainly ſeen, that he does not abandon himſelf to grief and dejection; but is ſolicitous to maintain that firmneſs of aſpect which the gladiators valued themſelves on preſerving in this ſeaſon of diſtreſs, and that attitude which they had learnt of the maſters of defence. He fears not death, nor ſeems to betray any tokens of fear by his countenance, nor to ſhed one tear: *quis mediocris gladiator ingemuit, quis vultum mutavit unquam, quis non modo ſtetit, verum etiam decubit turpiter*, ſays Cicero, in that part of his Tuſculan where he is deſcribing the aſtoniſhing firmneſs of thoſe perſons. We ſee, in this inſtance, notwithſtanding his remaining ſtrength, that he has but a moment to live; and we view him with attention, that we may ſee him expire and fall: thus the ancients knew how to animate marble, and give it almoſt every expreſſion of life. Gladiators || Glamorganſhire.

GLADIOLUS, CORN FLAG, a genus of plants belonging to the triandria claſs, and in the natural method ranking under the ſixth order *Enſatæ*. See BOTANY *Index*.

GLAIR of eggs, is the ſame as the white of eggs, and is uſed as a varniſh for preſerving paintings. For this purpoſe it is beat to an unctuous conſiſtence, and commonly mixed with a little brandy or ſpirit of wine, to make it work more freely, and with a lump of ſugar to give it body and prevent its cracking: and then ſpread over the picture or painting with a bruſh.

GLAMORGANSHIRE, a county of South Wales, ſaid to have derived its name from a contraction of the Welſh words *Gwald Morgan*, or "the county of Morgan," and ſuppoſed to have been thus called from a prince of this part of the country, ſaid to have been killed 800 years before the birth of our Saviour: but ſome other writers derive the name from the word *Mor*, which in the Britiſh tongue ſignifies the *ſea;* this being a maritime county. It is bounded on the ſouth and part of the weſt, by Briſtol channel; on the north-weſt, by Caermarthenſhire; on the north by Brecknockſhire; and on the eaſt, by Monmouthſhire. It extends 48 miles in length from eaſt to weſt, 27 in breadth from north to ſouth, and is 116 in circumference. It is divided into 10 hundreds, in which are one city, 7 market towns, 118 pariſhes, about 10,000 houſes, and 58,000 inhabitants. It is in the dioceſe of Llandaff. This county, in the time of the Romans, was part of the diſtrict inhabited by the Silures, and had ſeveral Roman ſtations. Thus Boverton, a few miles to the ſouth of Cowbridge, is ſuppoſed to be the Bovium of Antoninus: Neath to be his Nidum; and Loghor, to the weſt of Swanſey, to be his Leucarum. The principal rivers of this county are the Rhymny, the Taff, the Ogmore, the Avon, the Cledaugh, and the Tave. The air, in the ſouth part, towards the ſea, is temperate and healthful; but the northern part, which is mountainous, is cold and piercing, full of thick woods, extremely barren, and thin of inhabitants. The mountains, however, ſerve to feed herds of cattle, and ſend forth ſtreams which add greatly to the fertility of the other parts of the county:

Glamorganſhire || Glaris.

county: they have likewiſe coal and lead ore. The ſouth part is ſo remarkably fertile, pleaſant, and populous, that it is generally ſtyled the garden of Wales; but it has no manufacture. This county was formerly full of caſtles, moſt of which are now fallen to decay. It has many ſmall harbours on the coaſt for exporting coals and proviſions. Of the former it ſends large quantities both to England and Ireland; but of the latter, to England almoſt ſolely, eſpecially butter. It ſends two members to parliament, one for the ſhire, and one for the borough of Cardiff the capital.

GLAMOUR, or GLAMER, an old term of popular ſuperſtition in Scotland, denoting a kind of magical miſt believed to be raiſed by ſorcerers, and which deluded their ſpectators with viſions of things which had no real exiſtence, altered the appearance of thoſe which really did exiſt, &c.—The eaſtern nations have a ſimilar ſuperſtition, as we may learn from the Arabian Nights Entertainments and other works of oriental fiction.

GLAND, in *Anatomy*. See ANATOMY *Index*.

GLANDERS. See FARRIERY *Index*.

GLANDORE, a town of Ireland, ſituated in the county of Cork and province of Munſter, near the harbour of that name.

GLANDORE Harbour, ſituated two leagues weſt of the Galley-head in the county of Cork, province of Munſter, N. Lat. 51. 22. W. Long. 8. 56. Between this harbour and Roſs the coaſt continues high and bold, with only two ſmall coves; that to the eaſt called *Millcove*, and that to the weſt *Cowcove*. This harbour lies three miles weſt of Roſs; and though ſmall, is an exceeding good one; near it is a caſtle of the ſame name, and on the upper end is a deep and dangerous glin, called the *Leap*. Glandore gives title of carl to the family of Croſbie.

GLANDULÆ RENALES. See ANATOMY *Index*.

GLANS, in *Anatomy*, the tip or button of the penis, or that part covered with the prepuce, called alſo *balanus*. See ANATOMY *Index*.

GLANS is alſo uſed to denote the tip or extremity of the clitoris, from its reſemblance, both in form and uſe, to that of the penis. See ANATOMY *Index*.

GLANVIL, JOSEPH, a learned and ingenious, but fanciful and credulous, writer in the 17th century, was born at Plymouth in 1636, and bred at Oxford. He became a great admirer of Mr Baxter, and a zealous perſon for a commonwealth. After the Reſtoration, he publiſhed The Vanity of Dogmatizing; was choſen a fellow of the Royal Society; and, taking orders in 1662, was preſented to the vicarage of Frome-Selwood in Somerſetſhire. The ſame year he publiſhed his *Lux Orientalis*: in 1665, his *Scepſis Scientifica*; and in the year following, Some Philoſophical Conſiderations touching the being of Witches and Witchcraft, and other pieces on the ſame ſubject. In 1660, he publiſhed *Plus ultra*; or, The Progreſs and Advancement of Knowledge ſince the Days of Ariſtotle. He likewiſe publiſhed A ſeaſonable Recommendation and Defence of Reaſon; and *Philoſophia Pia*, or A Diſcourſe of the Religious Temper and Tendencies of the Experimental Philoſophy. In 1678 he was made a prebendary of Worceſter, and died in 1680.

GLARIS, one of the cantons of Swiſſerland, is bounded on the eaſt, partly by the Griſons, and partly by the territory of Sargans; on the north, by the bailiwick of Gaſter, and by the lake Wahleſtatt; on the eaſt, by the canton of Schwits; and on the ſouth, by part of the canton of Uri, and part of the league of the Griſons. It is a mountainous country, being entirely within the Alps.

Glaris, Glaſgow.

GLARIS, a town of Swiſſerland, capital of the canton of the ſame name, is ſeated in a plain, at the foot of high craggy mountains. The ſtreets are large, and the houſes kept in good repair. It has ſome public buildings; among which are two churches, one in the middle of the town, and the other without upon an eminence. In this eminence there is a cavern, with groteſque figures formed by the water that drops therein. The general aſſemblies of the country were formerly held on the firſt Sundays in May, where all the males above the age of ſixteen were obliged to appear. Both the Calviniſts and the Roman Catholics are tolerated in this town, and they have divine ſervice by turns in the ſame church. It is ſeated on the river Lint, E. Long. 9. 13. N. Lat. 47. 6.

GLASGOW, a large city of Lanerkſhire or Clydeſdale in Scotland, ſituated in W. Long. 4. 30. N. Lat. 55. 50.

Concerning the foundation of this city we have no authentic records. The word in the Gaelic language ſignifies a *gray ſmith*; from whence it has been inferred, that ſome ſpot in the moſt ancient part of the city was originally the reſidence of ſome blackſmith who had become eminent in his profeſſion, ſo that the place went by his name.

In the year 560, a biſhopric is ſaid to have been founded here by Saint Mungo, or Kentigern, ſuppoſed to be the ſon of Thamates, daughter of Loth king of the Picts; but in what ſtate the town at that time was, is altogether uncertain. Moſt probably the prieſts and diſciples who attended St Kentigern would contribute conſiderably towards its advancement; the aged and infirm, who were unfit for the purpoſes of war, or ſuch as were religiouſly inclined, would come and ſettle round the habitation of the holy man, in order to have the benefit of his prayers; and as a number of miracles were ſaid to have been wrought at his tomb, the ſame cauſes would ſtill contribute to the increaſe of the town.

Biſhopric of Glaſgow, when founded.

Hiſtory has not informed us of the name of the prince who founded and endowed the biſhopric of Glaſgow in favour of St Kentigern. But from an abſtract of the life of Kentigern (contained in Mr Innes's Critical Eſſay on the Ancient Inhabitants of Scotland), which was written in the 12th century, we learn, that the ſaint being ill uſed by Marken or Marcus, one of the kings of the Britons, retired into Wales. On the invitation of Roderic, however, one of Marken's ſucceſſors, he returned to Glaſgow, and enjoyed the ſee till 601, when he died. He was buried in the church of Glaſgow, where his monument is ſtill to be ſeen; and we find him marked among the ſaints in the Roman kalendar, January 13. 577.

The immediate ſucceſſors of Kentigern were Baldrede and Conwal. The firſt eſtabliſhed a religious houſe at Inchinnan; the ſecond went into Lothian to preach to the Saxons; and both of them are ranked as ſaints in the Roman kalendar, Baldrede on the 6th of March.

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March 608, and Conwal on the 18th of May 612. From this time, however, till the 1115, we have no diſtinct accounts concerning the city or biſhopric of Glaſgow. We find then, that David I. king of Scotland made an attempt to retrieve the people from a ſtate of groſs barbarity into which they were fallen, and reſtored to the church thoſe lands of which they had been robbed. The only account we have of the tranſactions with regard to Glaſgow, during that period, is in the inquiſition made by David concerning the church lands of Glaſgow, and is as follows.—"This church, by the divine appointment, admitted St Kentigern into the biſhopric, who furniſhed large draughts of knowledge to thoſe thirſting after heavenly things, &c. But a fraudulent deſtroyer, employing his common wiles, brought in, after a long ſeries of time, unaccountable ſcandals into the Cumbrian church. For after St Kentigern and many of his ſucceſſors were removed to heaven, various diſturbances everywhere ariſing, not only deſtroyed the church and her poſſeſſions, but, waſting the whole country, drove the inhabitants into exile. Theſe good men being deſtroyed, various tribes of different nations flocking in from ſeveral quarters, poſſeſſed the foreſaid deſerted country; but being of different origins, and varying from each other in their language and cuſtoms, and not eaſily agreeing among themſelves, they followed the manners of the Gentiles, rather than thoſe of the true faith. The inhabitants of which unhappy and abandoned country, though living like brutes, the Lord, who chooſes that none ſhould periſh, vouchſafed to viſit in mercy," &c.

2 Barbarity of the people in the time of David I.

From the year 1116 to the Reformation, the records of the biſhopric are tolerably complete. The moſt remarkable particulars furniſhed by them are the following.

In 1136, John Achaius, choſen biſhop of Glaſgow by David I. built and adorned a part of the cathedral, which he ſolemnly conſecrated on the 9th of July. The king was preſent at the ceremony; and beſtowed on the church the lands of Perdeyk, now Patrick. This prelate alſo divided the dioceſe into the two archdeanries of Glaſgow and Teviotdale; and eſtabliſhed the offices of dean, ſubdean, chancellor, treaſurer, ſacriſt, chantor, and ſucceſſor; and ſettled a prebendary upon each of them, out of the donatives he received from the king.

In 1174, Joceline, abbot of Melroſe, was elected biſhop, and conſecrated by Eſkilus, biſhop of Lunden in Denmark, the pope's legate for that kingdom, on the 1ſt of June 1175. He rebuilt the cathedral, or rather made an addition to the church already built by John Achaius. He alſo procured a charter from William king of Scotland, erecting Glaſgow into a royal borough, and likewiſe a charter for a fair to be held there annually for eight days.

3 Glaſgow erected into a royal borough.

In 1335, John Lindſay, biſhop of Glaſgow, was killed in an engagement at ſea with the Engliſh, as he was returning home from Flanders. His ſucceſſor, William Rae, built the ſtone bridge over the Clyde. In the time of Matthew Glendoning, who was elected biſhop in 1387, the great ſpire of the church, which had been built only of wood, was conſumed by lightning. The biſhop intended to have built another of ſtone: but was prevented by death, in 1408, from accompliſhing his purpoſe. His ſucceſſor, William Lauder, laid the foundation of the veſtry of the cathedral, and built the great tower of ſtone as far as the firſt battlement. The great tower of the epiſcopal palace was founded about the year 1437, on which Biſhop Cameron expended a great deal of money. Glaſgow.

In 1447, William Turnbull, a ſon of the family of Bedrule in Roxburghſhire, was choſen biſhop. He obtained from King James II. in 1450, a charter erecting the town and the patrimony of the biſheps into a regality. He alſo procured a bull from Pope Nicholas V. for erecting an univerſity within the city, which he endowed, and on which he alſo beſtowed many privileges. He died in 1454, leaving behind him a moſt excellent character. The eſtabliſhment of the college contributed more than any thing that had been formerly done towards the enlargement of the town. Before this time the town ſeems to have been inconſiderable. Mr Gibſon * is of opinion, that the number of its inhabitants did not exceed 1500. But though the eſtabliſhment of the univerſity greatly increaſed the number of inhabitants, it in fact deſtroyed the freedom of the town. Biſhop Turnbull ſeems to have made a point of it with King James II. that the city of Glaſgow, with the biſhop's foreſt, ſhould be erected into a regality in his favour; which was accordingly done at the time above mentioned; and this at once took away all power from the citizens, and tranſferred it to the biſhop. As the powers of the biſhop, however, were reckoned by Turnbull inſufficient to convey to the members of the univerſity all that freedom which he wiſhed to beſtow upon them, he therefore obtained from the king a great many privileges for them; and afterwards he himſelf, with the conſent of his chapter, granted them many more.

4 Glaſgow erected into a regality, and the univerſity founded.

* *Hiſt. of Glaſgow*, P. 74.

5 Which deſtroys the freedom of the city.

The good effects of the eſtabliſhment of the college were very ſoon obvious in Glaſgow. The number of inhabitants increaſed exceedingly; the high ſtreet, from the convent of the Black Friars, to where the croſs is now placed, was very ſoon filled up; the ancient road which led to the common being too far diſtant for the conveniency of the new inhabitants, the Gallows-gate began to be built. Soon after, the collegiate church of the bleſſed Mary (now the Tron church) being founded by the citizens, occaſioned the Trongate ſtreet to be carried to the weſtward as far as the church. The reſt of the city increaſed gradually towards the bridge, by the building of the Saltmarket ſtreet. The borough roads, and the cattle that grazed on the commons, were now found inſufficient to maintain the increaſed number of inhabitants; for which reaſon a greater degree of attention than formerly was paid to the fiſhing in the river. Many poor people ſubſiſted themſelves by this occupation; they were incorporated into a ſociety; and in order that they might be at hand to proſecute their buſineſs, they built a conſiderable part of the ſtreet now called the *Bridge-gate*, but at that time *Fiſhers-gate*.

6 Population of Glaſgow increaſed by the univerſity.

Notwithſtanding all this, however, the city of Glaſgow did not for a long time attain the rank among the other towns of Scotland which it holds at preſent. In 1556, it held only the 11th place among them, as appears by Queen Mary's taxation. The introduction of the reformed religion proved for ſome time prejudicial to the opulence of the city. The money which had

Glaſgow. had formerly been expended among the citizens by the biſhop and his clergy, was now diverted into other channels: the advantages reſulting from the univerſity were alſo for a time loſt; for as the reformers generally deſpiſed human learning, the college was in a manner deſerted.

7 Great part of the town deſtroyed by a fire.

In the time of the civil wars, Glaſgow ſuffered ſeverely. To the miſchief attending inteſtine diſcord, were added a peſtilence and famine; and to complete their misfortunes, a violent fire broke out in June 1652, which deſtroyed the greateſt part of the Saltmarket, Trongate, and High ſtreet. The fronts of the houſes at that time were moſtly of wood, ſo that they became an eaſy prey to the flames. The fire continued with great violence for the ſpace of 18 hours; by which a great many of the inhabitants were ruined, the habitations of almoſt 1000 families being totally deſtroyed. On this account collections were made through different parts of the country; and to prevent ſuch accidents for the future, the fronts were built with freeſtone, which abounds in the neighbourhood.

By the charter given to Biſhop Turnbull in 1450, the citizens had been deprived of the power of electing their own magiſtrates, which was thenceforth exerciſed by the biſhop; which, however, was not done without ſome reſiſtance on the part of the inhabitants. After the Reformation was introduced into Scotland, we find this power exerciſed by the citizens, the biſhop, the earl of Lennox, and others. The idea that the town was a biſhop's borough, and not a royal free borough, gave occaſion to this unſettled manner of appointing the magiſtracy; and though, in 1633, they were declared to be a royal free borough by the parliament, yet their freedom of election was afterwards diſturbed by the privy council, by Cromwell, and the duke of York.

8 Glaſgow declared free by William and Mary.

But on the 4th of June 1690, the town was declared free by a charter of William and Mary; and in confirmation of this charter it was inſerted in the act of parliament, dated June 14th the ſame year, that they ſhould have power to elect their own magiſtrates as fully and freely, in all reſpects, as the city of Edinburgh or any other royal borough within the kingdom; which freedom of election ſtill continues.

By the aſſeſſment of the boroughs in 1695, we find the city of Glaſgow reckoned the ſecond in Scotland in point of wealth, which place it ſtill continues to hold.

9 Great increaſe of its wealth.

To account for this great increaſe of wealth, we muſt obſerve, that for a long time, even before the reſtoration of Charles II. the inhabitants of Glaſgow had been in poſſeſſion of the ſale of both raw and refined ſugars for the greateſt part of Scotland; they had a privilege of diſtilling ſpirits from their molaſſes, free of all duty and exciſe; the herring fiſhery was alſo carried on to what was at that time thought a very conſiderable extent; they were the only people in Scotland who made ſoap; and they ſent annually ſome hides, linen, &c. to Briſtol, from whence they brought back in exchange, a little tobacco, ſugar, and goods, of the manufacture of England, with which they ſupplied a conſiderable part of the kingdom. From the year 1707, however, in which the union betwixt Scotland and England took place, we may date the proſperity of Glaſgow. By the union, the American trade was laid open to the inhabitants: and ſo ſenſible were they of their advantageous ſituation, that they began almoſt inſtantly to

Glaſgow. proſecute that commerce; an aſſiduous application to which, ever ſince, hath greatly contributed to raiſe the city to the pitch of affluence and ſplendour which it at preſent enjoys. The city was now greatly enlarged; and as the community were ſenſible of the inconvenience that attended the want of a ſufficient quantity of water in the river for carrying on their commerce, they reſolved to have a port of their own nigher the mouth of the river. At firſt, they thought of making their harbour at Dumbarton: but as this is a royal borough, the magiſtrates oppoſed it; becauſe they thought that the influx of ſailors and others, occaſioned by the harbour, would be ſo great, that a ſcarcity of proviſions would be occaſioned. The magiſtrates and town council of Glaſgow, therefore, purchaſed ſome lands on the ſouth ſide of the river Clyde for this purpoſe; and ſo expeditious were they in making their harbour, and rearing their town, that in 1710 a bailie was appointed for the government of Port-Glaſgow. It is now a very conſiderable pariſh, and lies 21 miles nigher the mouth of Clyde than Glaſgow.

10 Erection of Port Glaſgow.

In 1725, Mr Campbell, the member of parliament for Glaſgow, having given his vote for having the malt tax extended over Scotland, a riot enſued among the lower claſs of people. In this diſturbance, Mr Campbell's furniture was deſtroyed, and ſome exciſemen were maltreated for attempting to take an account of the malt. General Wade, who commanded the forces in Scotland, had ſent two companies of ſoldiers, under the command of Captain Buſhel, to prevent any diſturbance of this kind. Captain Buſhel drew up his men in the ſtreet, where the multitude pelted them with ſtones. He firſt endeavoured to diſperſe the mob by firing with powder only: but this expedient failing, he ordered his men to load their pieces with ball; and, without the ſanction of the civil authority, commanded them to fire four different ways at once. By this diſcharge about 20 perſons were killed and wounded; which enraged the multitude to ſuch a degree, that having procured ſome arms, they purſued Buſhel and his men to the caſtle of Dumbarton, about 14 miles diſtant. General Wade being informed of this tranſaction, aſſembled a body of forces, and being accompanied by Duncan Forbes, lord advocate, took poſſeſſion of the town: the magiſtrates were apprehended and carried priſoners to Edinburgh; but on an examination before the lords, their innocence clearly appeared, upon which they were immediately diſmiſſed. Buſhel was tried for murder, convicted, and condemned; but, inſtead of ſuffering the penalties of law, he was indulged with a pardon, and promoted in the ſervice. Mr Campbell petitioned the houſe of commons for an indemnification of his loſſes: a bill was paſſed in his favour; and this, together with ſome other expences incurred in the affair, coſt the town 9000l. ſterling.

11 Diſturbance about the exciſe bill.

During the time of the rebellion 1745, the citizens of Glaſgow gave proof of their attachment to revolution principles, by raiſing two battalions of 600 men each, for the ſervice of government. This piece of loyalty, however, had like to have coſt them dear. The rebels, in their journey ſouth, took a reſolution to plunder and burn the city: which would probably have been done, had not Mr Cameron of Lochiel threatened, in that caſe, to withdraw his clan. A heavy con-

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tribution, however, was laid on. The city was compelled to pay 5000l. in money, and 500l. in goods; and on the return of the rebels from England, they were obliged to furniſh them with 12,000 linen ſhirts, 6000 cloth coats, 6000 pairs of ſhoes, 6000 pairs of hoſe, and 6000 bonnets. Theſe goods, with the money formerly paid them, the expence of raiſing and ſubſiſting the two city battalions, and the charge of maintaining the rebel army in free quarters for ten days, coſt the community about 14,000l. ſterling; 10,000l. of which they recovered in 1749, by an application to parliament.

12 Change of manners and method of living.

About the year 1750, a very conſiderable change took place in the manner of living among the inhabitants of Glaſgow. Till this time, an attentive induſtry, and a frugality bordering upon parſimony, had been their general characteriſtic; the ſeverity of the ancient manners prevailed in its full vigour: But now, when an extenſive commerce and increaſed manufactures had produced wealth, the ideas of the people were enlarged, and ſchemes of trade and improvement were adopted which people would formerly have been denominated madmen if they had undertaken; a new ſtyle was introduced in living, dreſs, building, and furniture; wheel carriages were ſet up, public places of entertainment were frequented, and an aſſembly-room, ball-room, and playhouſe, were built by ſubſcription; and from this time we may date all the improvements that have taken place, not only in Glaſgow, but all over the weſt of Scotland. The beſt method, however, of eſtimating the growing improvement of any town, is by the frequency of their applications for aſſiſtance to parliament; we ſhall therefore enumerate the acts of parliament which have been paſſed in favour of the city of Glaſgow ſince the year 1750. In 1753, an act paſſed for repairing ſeveral roads leading into the city of Glaſgow. In 1756, an act for erecting and ſupporting a lighthouſe in the iſland of Little Cumray, at the mouth of the Clyde, and for rendering the navigation of the frith and river more ſafe and commodious.—In 1759, an act for improving the navigation of the river Clyde to the city of Glaſgow, and for building a new bridge acroſs the river.—In 1767, the people of Glaſgow having propoſed to make a ſmall cut or canal from the frith of Forth to that of Clyde, for the conveniency of their trade to the eaſtern ſide of the iſland, ſeveral gentlemen at Edinburgh, and throughout different parts of the kingdom, propoſed that this canal ſhould be executed upon a much larger ſcale than what had been originally projected. An act was accordingly obtained, and the canal executed in the manner deſcribed under the article CANAL.—In 1770, another act was obtained for improving the navigation of the river, building the bridge, &c. being an amendment of the former act for theſe purpoſes. In 1771, an act for making and widening a paſſage from the Saltmarket to St Andrew's church; for enlarging and completing the churchyard of that church, and likewiſe for building a convenient exchange or ſquare in the city; alſo for amending and explaining the former act relative to the navigation of the Clyde. An act for making and maintaining a navigable canal and waggon way from the collieries in the pariſhes of Old and New Monkland, to the city of Glaſgow. This laſt canal, which was undertaken with a view to reduce the price of coals, has not been attended with the deſired effect; but the other improvements have been productive of very great advantages.

13 Acts of parliament in favour of the city.

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14 Deſcription of the city.

The moſt ancient part of the city ſtands on a riſing ground. The foundation of the cathedral is 104 feet higher than the bed of the river; and the deſcent from the high ground reaches to about 100 yards below the college. The reſt of the city is built chiefly upon a plain, bounded ſouthward by the Clyde, and northward by a gentle ridge of hills lying in a parallel direction with that river. Theſe grounds, till lately, conſiſted of gardens and fields; but are now covered with buildings, in conſequence of the increaſing wealth and population of the city. The ſtreets are all clean and well paved; and ſeveral of them interſecting one another at right angles, produce a very agreeable effect. The four principal ſtreets, croſſing one another in that manner, divide the city nearly into four equal parts; and the different views of them from the croſs, or centre of interſection, have an air of great magnificence. The houſes, conſiſting of four or five floors in height, are built of hewn ſtone, generally in an exceeding good taſte, and many of them elegant. The moſt remarkable public buildings are,

15 Of the cathedral.

1. *The Cathedral*, or *High Church*, is a magnificent building, and its ſituation greatly to its advantage, as it ſtands higher than any part of the city. It has been intended to form a croſs, though the tranſverſe part has never been finiſhed. The great tower is founded upon four large maſſy pillars, each of them about 30 feet in circumference. The tower itſelf is 25½ feet ſquare within; and is ſurrounded by a balluſtrade, within which riſes an octangular ſpire terminated by a vane. The tower upon the weſt end is upon the ſame level, but appears not to have been finiſhed, though it is covered over with lead. In this tower is a very large bell 11 feet four inches in diameter. The principal entry was from the weſt; the gate 11 feet broad at the baſe, and 17 feet in height. The weſt end of the choir is now appropriated for a place of divine worſhip; and is divided from the remaining part by a ſtone partition, which is encloſed by another ſtone wall parting it from the nave. It is impoſſible to form an adequate idea of the awful ſolemnity of the place occaſioned by the loftineſs of the roof and the range of pillars by which the whole is ſupported.

The nave of the church riſes four ſteps higher than the choir; and on the weſt ſide ſtood the organ loft, formerly ornamented with a variety of figures, but now defaced. The pillars here are done in a better taſte than thoſe in the choir, and their capitals are ornamented with fruits. The arched roof of the altar is ſupported by five pillars, over which was a fine terrace walk, and above it a large window of curious workmanſhip, but now ſhut up. On the north ſide of the altar is the veſtry, being a cube of 28 feet, the roof arched and vaulted at top, and ſupported by one pillar in the centre of the houſe. Arched pillars from every angle terminate in the grand pillar, which is 19 feet high. The lower part of the ſouth croſs is made uſe of as a burying place for the clergy of the city; and is by much the fineſt piece of workmanſhip in the whole building. It is 55 feet long, 28 broad, and

Glaſgow. 15 high; arched and vaulted at top, and ſupported by a middle range of pillars, with their capitals highly ornamented; correſponding to which are columns adjoining to the walls, which, as they riſe, ſpring into ſemi-arches, and are everywhere met at acute angles by their oppoſites, and are ornamented with carvings at the cloſing and croſſing of the lines. At the eaſt end of the choir you deſcend by flights of ſteps upon each ſide into paſſages which, in former times, were the principal entries to the burying vault which is immediately under the nave. It is now made uſe of as a pariſh church for the barony of Glaſgow; and is full of pillars, ſome of them very maſſy, which ſupport the arched roof: but it is a very uncomfortable place for devotion. The ſpace under the altar and veſtry, though now made uſe of as a burying place by the heritors of the barony, was formerly, according to tradition, employed for keeping of the relicks; and indeed, from the beautiful manner in which this place is finiſhed, one would imagine that it had not been deſtined for common uſe. Here is ſhown the monument of St Mungo, or Kentigern, with his figure lying in a cumbent poſture.

The whole length of the cathedral within the walls is 284 feet, its breadth 65; the height of the choir, from the floor to the canopy, 90 feet; the height of the nave, 85 feet; the height of the middle tower, 220 feet. This fabric was begun by John Achaius in 1123, and conſecrated in 1136: and continued by ſucceeding biſhops till ſuch time as it was finiſhed in the manner in which it ſtands at preſent. The wealth of the ſee of Glaſgow, however, was not ſufficient for ſo great an undertaking, ſo that they were obliged to have recourſe to all the churches of Scotland for aſſiſtance in it.

This venerable edifice was in danger of falling a victim to the frenzy of fanaticiſm in 1579; and owed its preſervation to the ſpirit and good ſenſe of the tradeſmen, who, upon hearing the beat of drum for collecting the workmen appointed to demoliſh it, flew to arms, and declared that the firſt man who pulled down a ſingle ſtone ſhould that moment be buried under it.

Near the cathedral are the ruins of the biſhop's palace or caſtle, encloſed with a wall of hewn ſtone by Archbiſhop James Beaton; the great tower built by Archbiſhop Cameron in 1426.

16 St Andrew's church.

2. *St Andrew's Church* was begun by the community in 1739, and finiſhed in 1756. It is the fineſt piece of modern architecture in the city; and is built after the model of St Martin's in the Fields, London, whoſe architect was the famous Gibbs. The length of the church is 104 feet, and its breadth 66. It has a fine arched roof, well ornamented with figures in ſtucco, and ſuſtained by ſtone columns of the Corinthian order. Correſpondent to the model, it has a place for the altar on the eaſt, in which is a very ancient Venetian window; but the altar place being ſeated, makes this end appear to no great advantage. The fronts of the galleries and the pulpit are done in mahogany in a very elegant manner. The ſpire by no means correſponds with the reſt of the building; and, inſtead of being an ornament, diſgraces this beautiful fabric. Its height is 170 feet.

Beſides the cathedral (which contains three congregations) and St Andrew's church, there is a number of others, as the College church, Ram's-horn, Tron, St Enoch's, and St George's; together with an Engliſh chapel, Highland church, ſeveral ſeceding meeting-houſes, and others for ſectaries of various denominations. Glaſgow.

17 The college.

3. *The College.*—The front of this building extends along the eaſt ſide of the High ſtreet, and is upwards of 330 feet long. The gate at the entrance is decorated with ruſtics, and over it are the king's arms. The building conſiſts of two principal courts or ſquares. The firſt is 88 feet long and 44 broad. The weſt ſide is elevated upon ſtone pillars, on which are placed pilaſters ſupporting the Doric entablature, and ornamented with arches forming a piazza. Above theſe is the public hall; the aſcent to which is by a double flight of ſteps encloſed by a handſome ſtone balluſtrade, upon the right of which is placed a lion, and on the left an unicorn, cut in freeſtone. The ſpire ſtands on the eaſt ſide, is 135 feet high, and has a very good clock. Under this is the gateway into the inner and largeſt court, which is 103 feet long and 79 broad. Over the entry, in a niche, is a ſtatue of Mr Zacharias Boyd, who was a benefactor to the univerſity. On the eaſt ſide of the court is a narrow paſſage leading into a handſome terrace walk, gravelled, 122 feet long by 64 feet broad. This walk is encloſed to the eaſt by an iron palliſade, in the centre of which is a gate leading into the garden. This laſt conſiſts of ſeven acres of ground, laid out in walks for the recreation of the ſtudents; and there is alſo a botanic garden. On the ſouth ſide of the walk ſtands the library; a very neat edifice, well conſtructed for the purpoſe intended, and containing a very valuable collection of books. Underneath are preſerved in caſes all the Roman inſcriptions found on Graham's Dike, together with altars and other antiquities collected from different parts of Scotland.—Adjoining there is an obſervatory, well furniſhed with aſtronomical inſtruments. The college alſo poſſeſſes, by bequeſt, the late Dr Hunter's famous anatomical preparations, library, and muſeum. A building was erected in 1806 for its reception.

18 Town-houſe, &c.

4. *The Tolbooth*, or *Town-Houſe*, is a magnificent and extremely elegant building. The front is adorned with a range of Ionic pilaſters; and is elevated on ſtrong ruſticated pillars with arches, forming a piazza for merchants and others to ſhelter themſelves from the weather when met upon buſineſs. One of the apartments was the aſſembly hall; a neat room, 47 feet long, and 24 in breadth and height, finiſhed in a good taſte, though too ſmall for the city. The town hall is a very ſpacious and lofty apartment, 52 feet long by 27 broad, and 24 in height. It is finiſhed in a very grand manner; the ceiling is divided into different compartments well ornamented. In it are full length portraits of King James VI. and VII. Charles I. and II. William and Mary, Queen Anne, King George I. II. and III. and Archibald duke of Argyll in his juſticiary robes. The two laſt are by Ramſay. Oppoſite to the front of this building is the exchange walk, which is well paved with freeſtone, and encloſed from the ſtreet by ſtone pillars. In the middle of this area is an equeſtrian ſtatue of King William III. placed upon a lofty pedeſtal, and ſurrounded with an iron rail.—In 1781, the exchange under the piazzas was greatly enlarged, by taking down the lower part of the town hall and aſſembly

Glaſgow. room; and at the ſame time, by a tontine ſcheme entered into by the inhabitants, a moſt elegant coffee room was added, with a ſuite of buildings adjoining for the purpoſes of a tavern and hotel, aſſembly room, and offices for notaries and underwriters. The aſſembly room, however, being found to be ſtill too ſmall, a ſubſcription of above 5000l. has been raiſed by a ſimilar plan of a tontine for building a new one, which is propoſed to be erected in the north corner of one of the new ſtreets which join Ingram ſtreet to Argyll ſtreet.

19 Guild hall. 5. *The Guild Hall* or *Merchants Houſe.* This building is ſituated upon the ſouth ſide of Bridgegate ſtreet; and is in length 82 feet, in breadth 31. The great hall, which is the whole length and breadth of the building, is ſo capacious, that it is better adapted for the reception of great and numerous aſſemblies than any other in the city. This houſe is adorned with a very elegant ſpire 200 feet high.

20 Town's hoſpital. 6. *The Town's Hoſpital* is a very neat building, conſiſting of two wings and a large front; the length 156 feet, the breadth of the centre 30 feet, and the depth of the wings 68 feet. Behind the building is an infirmary 127 feet long by 25 feet broad, the aſcent to which is by a flight of ſteps. The lower part of this building is appointed for the reception of lunatics. The area between the buildings is large, which, with the agreeable open ſituation of the hoſpital on the river, muſt conduce to the health of the inhabitants.

21 Grammar ſchool. 7. *The Grammar School* is ſituated in the new part of the town, to the north-weſt, and was built in 1787. It is a very handſome building, containing a large hall, and ſix airy commodious teaching rooms. In this ſchool there are four claſſes, the courſe being four years: each claſs is carried on the whole four years by the ſame maſter; ſo that, there being no rector, each maſter is head of the ſchool one year in rotation. It is under the direction of a committee of the town council; who, aſſiſted by the profeſſors, clergy, and other perſons of learning, frequently viſit it during the ſeſſion; and at an annual examination, prizes of books are diſtributed to the ſcholars according to their reſpective merits. The number of ſcholars is above 300. The building is not yet entirely finiſhed; and the rooms which are not occupied by the Latin claſſes are intended for teaching writing, arithmetic, drawing, &c.

22 New Bridge. 8. *The New Bridge* is built in an elegant manner. It is 32 feet wide, with a commodious footway for paſſengers, five feet broad on each ſide, raiſed above the road made for carriages, and paved with freeſtone. This bridge is about 500 feet in length, and conſiſts of ſeven arches, the faces of which are wrought in ruſtic, with a ſtrong block cornice above. The arches ſpring but a little way above low water mark; which, though it renders the bridge ſtronger than if they ſprung from taller piers, diminiſhes its beauty. Between every arch there is a ſmall circular one: theſe break the force of the water when the river riſes to a flood, and add to the ſtrength of the whole. The parapet wall or breaſtwork is cut out in the Chineſe taſte, and the two ends are finiſhed off with a ſweep. This bridge was begun in 1768, and finiſhed in 1772.

23 Markets, &c. 9. *The Markets in King's Street* are juſtly admired, as being the completeſt of their kind in Britain. They are placed on both ſides of the ſtreet. That on the eaſt ſide, appropriated entirely for butcher meat, is 112 Glaſgow. feet in length, and 67 in breadth. In the centre is a ſpacious gateway, decorated on each ſide with coupled Ionic columns, ſet upon their pedeſtals, and ſupporting an angular pediment. At the north end is a very neat hall belonging to the incorporation of butchers, the front ornamented with ruſtics and a pediment. The markets upon the weſt ſide of the ſtreet conſiſt of three courts, ſet apart for fiſh, mutton, and cheeſe. The whole of the front is 173 feet, the breadth 46 feet; in the centre of which, as on the oppoſite ſide, is a very ſpacious gateway of the Doric order, ſupporting a pediment. This is the entry to the mutton market. Each of the other two has a well proportioned arch faced with ruſtics for the entrance. All theſe markets are well paved with freeſtone, have walks all round them, and are covered over for ſhelter by roofs ſtanding upon ſtone piers, under which the different commodities are expoſed to ſale. They have likewiſe pump wells within, for cleanſing away all the filth; which render the markets always ſweet and agreeable. Theſe markets were erected in 1754.

10. *The Market for Vegetables* is neat and commodious; and the principal entry is decorated with columns. It is ſituated in the Candleriggs, and is laid out in the ſame manner with the markets in King's Street.

24 Guard houſe. 11. *The Guard Houſe* is a very handſome building, with a piazza formed by arches, and columns of the Ionic order ſet upon their pedeſtals. It was originally ſituated on the High ſtreet, at the corner of the Candleriggs ſtreet: but has lately been carried near half way up the Candleriggs, where it occupies the ground on which the weigh houſe formerly ſtood, and is made larger and more commodious than it was before. An excellent new weigh-houſe has been erected at the head of the Candleriggs: And at the foot of the Candleriggs, or corner next the High ſtreet, where the guard-houſe was formerly ſituated, a ſuperb new hotel has been built, containing 75 fire rooms.

The moſt remarkable public charities in Glaſgow are,

25 Public charities. 1. *Muirhead's* or *St Nicholas's Hoſpital.* This was originally appointed to ſubſiſt 12 old men and a chaplain; but its revenues have, from ſome unknown cauſes, been loſt; ſo that no more of them now remains than the paltry ſum of 139l. 2s. 5d. Scots money, 12l. of which is annually divided among four old men, at the rate of 2l. 13s. 4d. ſterling each.

2. *Hutcheſon's Hoſpital*, was founded and endowed in 1639 by George Hutcheſon of Lamb-hill, notary public, and Mr Thomas Hutcheſon his brother, who was bred a preacher, for the maintenance of old men and orphans. The funds of this hoſpital were increaſed by James Blair, merchant in Glaſgow in 1710, and by ſubſequent donations. From the ſale of ſome of their lands which lay convenient for building, and the riſe of the reſt, the income is now above 1400l. which is diſtributed in penſions to old people from 3l. to 20l. and in educating about 50 children.

3. *The Merchants Houſe* likewiſe diſtributes in penſions and other charities about 800l. yearly.

4. *The Town's Hoſpital*, above deſcribed, was opened for the reception of the poor on the 15th of November 1733. The funds whence this hoſpital is ſubſiſted are, the general ſeſſion, the town council, the trades houſe

Glaſgow. houſe and merchants houſe, the intereſt of money belonging to their funds, which are ſums that have been mortified for the uſe of the houſe. Theſe ſupplies, however, are found inſufficient to defray the expences of the houſe; for which reaſon an aſſeſſment is annually made upon the inhabitants in the following manner. The magiſtrates nominate 12, 14, or ſometimes more gentlemen of known integrity and character, who have a liſt laid before them of all the inhabitants in town. This liſt they divide into 16 or 18 columns. Each of theſe columns contains the names of ſuch inhabitants as carry on trade to a certain extent, or are ſuppoſed to be well able to pay the ſum affixed to the particular column in which their names are inſerted. If it is neceſſary to raiſe 500l. for inſtance, then each name, in every ſeparate column, is valued at as much as the fortunes of the perſons in each particular column are ſuppoſed to be. If 1000l. or more is to be raiſed, it is only continuing a proportional increaſe through the whole of the columns. The higheſt ſum that ever was thus raiſed, was 12s. 6d. upon every thouſand pounds that each perſon was ſuppoſed to be worth. The number of people maintained in this hoſpital are about 620.

5. *Wilſon's Charity* for the education of boys, was founded by George Wilſon, who in 1778 left 3000l. for that purpoſe. This fund is now conſiderably increaſed, and gives education and clothing to 48 boys, who each continues four years, ſo that 12 are admitted annually.

Beſides theſe, there are many public ſchools for the education of children; as well as many inſtitutions of private ſocieties for the purpoſe of relieving the indigent and inſtructing youth, ſuch as *Graham's Society*, *Buchanan's Society*, the *Highland Society*, &c. Theſe laſt put annually 20 boys apprentices to trades, and during the firſt three years give them clothing and education.

26 Members of the univerſity.

The univerſity of Glaſgow owes its origin, as we have already obſerved, to Biſhop Turnbull. The inſtitution conſiſted at firſt of a rector, a dean of faculty, a principal who taught theology, and three profeſſors of philoſophy; and, ſoon after this, the civil and canon laws were taught by ſome clergymen. From the time of its eſtabliſhment in 1450 to the Reformation in 1560, the college was chiefly frequented by thoſe who were intended for the church; its members were all eccleſiaſtics, and its principal ſupport was derived from the church. The Reformation brought the univerſity to the verge of deſtruction: maſters, ſtudents, and ſervants, all forſook it. The magiſtrates were ſo ſenſible of the loſs which the community had ſuſtained by this deſertion, that they endeavoured to reſtore it in 1572, by beſtowing upon it conſiderable funds, and preſcribing a ſet of regulations for its management. Theſe, however, proved inſufficient; for which reaſon King James VI. erected it anew, by a charter called the *Nova Erectio*, 1577, and beſtowed upon it the teinds of the pariſh of Govan. The perſons who were to compoſe the new univerſity were, a principal, three profeſſors of philoſophy, four ſtudents burſars, one œconomus, a principal's ſervant, a janitor, and cook.

Since the year 1577, the funds of the univerſity have been conſiderably increaſed by the bounty of kings and the donations of private perſons. The profeſſors have therefore alſo been increaſed: ſo that at preſent the univerſity of Glaſgow conſiſts of a chancellor, rector, dean of faculty, principal, and 14 profeſſors (ſix of them in the gift of the crown), together with burſars, &c. The archbiſhop of Glaſgow was formerly chancellor of the univerſity *ex officio*; at preſent, the chancellor is choſen by the rector, dean of faculty, principal, and maſters. Glaſgow.

The chancellor, as being the head of the univerſity, is the fountain of honour, and in his name are all academical degrees beſtowed. The office of rector is to exerciſe that academical juriſdiction in diſputes among the ſtudents themſelves, or between the ſtudents and citizens, which is beſtowed upon the greater part of the univerſities in Europe. He is choſen annually in the *comitia*; that is, in a meeting in which all the ſtudents, as well as the other members of the univerſity, have a voice. Immediately after his admiſſion, he has been in uſe to chooſe certain perſons as his aſſeſſors; and counſellors in his capacity of judge; and, in former periods, it was cuſtomary to name the miniſters of Glaſgow, or any other gentlemen who had no connexion with the univerſity; but, for a great while paſt, the rector has conſtantly named the dean of faculty, the principal, and maſters, for his aſſeſſors; and he has always been, and ſtill is, in the daily practice of judging in the cauſes belonging to him, with the advice of his aſſeſſors. Beſides theſe powers as judge, the rector ſummons and preſides in the meetings of the univerſity for the election of his ſucceſſor; and he is likewiſe in uſe to call meetings of the profeſſors for drawing up addreſſes to the king, electing a member to the general aſſembly, and other buſineſs of the like kind.

The dean of faculty has, for his province, the giving direction with regard to the courſe of ſtudies; the judging, together with the rector, principal, and profeſſors, of the qualifications of thoſe who deſire to be created maſters of arts, doctors of divinity, &c.; and he preſides in meetings which are called by him for theſe purpoſes. He is choſen annually by the rector, principal, and maſters.

The principal and maſters, independent of the rector and dean, compoſe a meeting in which the principal preſides; and as they are the perſons for whoſe behoof chiefly the revenue of the college was eſtabliſhed, the adminiſtration of that revenue is therefore committed to them. The revenue ariſes from the teinds of the pariſh of Govan, granted by King James VI. in 1557; from the teinds of the pariſhes of Renfrew and Kilbride, granted by the ſame monarch in 1617, and confirmed by King Charles I. on the 28th of June 1630; from the teinds of the pariſhes of Calder, Old and New Monkland, conveyed to them by a charter from Charles II. in 1670; from a tack of the archbiſhopric; and from ſeveral donations conferred by private perſons.

The college of Glaſgow, for a very conſiderable time after its erection, followed the mode of public teaching which is common even to this day in Oxford and Cambridge, and in many other univerſities throughout Europe; that is, each profeſſor gave a few lectures every year, *gratis*, upon the particular ſcience which he profeſſed: but, in place of this, the profeſſors have, for a great while paſt, adopted the mode of private teaching: that is, they lecture and examine two hours every

Glaſgow. every day during the ſeſſion, viz. from the 10th of October to the 10th of June; a method which comes much cheaper to the ſtudent, as he has it in his power, if he is attentive, to acquire his education without being under the neceſſity of employing a tutor. They have alſo private claſſes, in which they teach one hour per day. The number of ſtudents who have attended this college for ſeveral years paſt, has been upwards of 500 each ſeaſon.

27 History of the trade of Glaſgow.

The trade of Glaſgow is ſaid to have been firſt promoted by one Mr William Elphinſtone in 1420. This trade was moſt probably the curing and exporting of ſalmon; but the firſt authentic document concerning Glaſgow as a trading city is in 1546. Complaints having been made by Henry VIII. king of England, that ſeveral Engliſh ſhips had been taken and robbed by veſſels belonging to Scotland, an order of council was iſſued, diſcharging ſuch captures for the future; and among other places made mention of in this order is the city of Glaſgow. The trade which at that time they carried on could not be great. It probably conſiſted of a few ſmall veſſels to France loaded with pickled ſalmon; as this fiſhery was, even then, carried on to a conſiderable extent, by Glaſgow, Renfrew, and Dumbarton. Between the years 1630 and 1660, a very great degree of attention ſeems to have been paid to inland commerce by the inhabitants of Glaſgow. Principal Baillie informs us, that the increaſe of Glaſgow ariſing from this commerce was exceedingly great. The exportation of ſalmon and of herrings was alſo continued and increaſed. In the war between Britain and Holland during the reign of Charles II. a privateer was fitted out in Clyde to cruiſe againſt the Dutch. She was called the *Lion of Glaſgow*, Robert M'Allan commander; and carried five pieces of cannon, and 60 hands.

A ſpirit of commerce appears to have ariſen among the inhabitants of Glaſgow between the years 1660 and 1707. The citizens who diſtinguiſhed themſelves moſt during this period were Walter Gibſon and John Anderſon. Gibſon cured and packed in one year 300 laſts of herrings, which he ſent to St Martin's in France on board of a Dutch veſſel called the *St Agate* of 450 tons burden; his returns were brandy and ſalt. He was the firſt who imported iron from Stockholm into Clyde. Anderſon is ſaid to have been the firſt who imported white wines.

Whatever their trade was at this time, it could not be conſiderable: the ports to which they were obliged to trade lay all to the eaſtward: the circumnavigation of the iſland would therefore prove an almoſt unſurmountable bar to the commerce of Glaſgow; and of conſequence the people on the eaſt coaſt would be poſſeſſed of almoſt all the commerce of Scotland. The union with England opened a field for commerce for which the ſituation of Glaſgow, ſo convenient in reſpect to the Atlantic, was highly advantageous. Since that time the commerce of the eaſt coaſt has declined, and that of the weſt increaſed to an amazing degree. No ſooner was the treaty of union ſigned, than the inhabitants of Glaſgow began to proſecute the trade to Virginia and Maryland; they chartered veſſels from Whitehaven, ſent out cargoes of goods, and brought back tobacco in return. The method in which they at firſt proceeded in this trade was certainly a very prudent one. A ſupercargo went out with every veſſel. Glaſgow. He bartered his goods for tobacco, until ſuch time as he had either ſold off his goods, or procured as much tobacco as was ſufficient to load his veſſel. He then immediately ſet out on his return; and if any of his goods remained unſold, he brought them home with him. While they continued to trade in this way, they were of great advantage to the country, by the quantity of manufactures which they exported; their own wealth began to increaſe; they purchaſed ſhips of their own; and, in 1718, the firſt veſſel of the property of Glaſgow croſſed the Atlantic. Their imports of tobacco were now conſiderable, and Glaſgow began to be looked upon as a conſiderable port: the tobacco made at the ports of Briſtol, Liverpool, and Whitehaven, was obſerved to dwindle away; the people of Glaſgow began to ſend tobacco to theſe places, and to underſell the Engliſh even in their own ports. Thus the jealouſy of the latter was ſoon excited, and they took every method in their power to deſtroy the trade of Glaſgow. The people of Briſtol preſented remonſtrances to the commiſſioners of the cuſtoms at London againſt the trade of Glaſgow, in 1717. To theſe remonſtrances the merchants of Glaſgow ſent ſuch anſwers to the commiſſioners, as convinced them that the complaints of the Briſtol merchants were without foundation. But in 1721, a moſt formidable confederacy was entered into by almoſt all the tobacco merchants in South Britain againſt the trade of Glaſgow. Thoſe of London, Liverpool, and Whitehaven, preſented ſeverally to the lords of the treaſury, petitions, arraigning the Glaſgow merchants of frauds in the tobacco trade. To theſe petitions the Glaſgow people gave in replies; and the lords of the treaſury, after a full and impartial hearing, were pleaſed to diſmiſs the cauſe with the following ſentence: "That the complaints of the merchants of London, Liverpool, and Whitehaven, were groundleſs; and that they proceeded from a ſpirit of envy, and not from a regard to the intereſt of trade, or of the king's revenue."

But the efforts of theſe gentlemen did not ſtop here. They brought their complaints into the houſe of commons. Commiſſioners were ſent to Glaſgow in 1722, who gave in their reports to the houſe in 1723. The merchants ſent up diſtinct and explicit anſwers to theſe reports; but ſuch was the intereſt of their adverſaries, that theſe anſwers were diſregarded. New officers were appointed at the ports of Greenock and Port Glaſgow, whoſe private inſtructions ſeem to have been to ruin the trade if poſſible, by putting all imaginable hardſhips upon it. Hence it languiſhed till the year 1735; but after that time it began to revive, though even after its revival it was carried on but ſlowly for a conſiderable ſpace of time.

At laſt, however, the active and enterpriſing ſpirit of the merchants, ſeconding the natural advantages of their ſituation, prevailed over all oppoſition; and the American trade continued to flouriſh and increaſe until the year 1775, inſomuch that the importation of tobacco into Clyde that year from the provinces of Virginia, Maryland, and Carolina, amounted to 57,143 hogſheads. But ſince the breach with America, this trade has now greatly fallen off, and very large ſums are ſaid to remain due to the merchants from that quarter of the world.

With

Glaſgow.

28 Manufactures of Glaſgow.

With regard to the manufactures of Glaſgow, Mr Gibſon is of opinion that the commerce to America firſt ſuggeſted the idea of introducing them, in any conſiderable degree at leaſt. The firſt attempts in this way were about the year 1725, and their increaſe for ſome time was very ſlow, nor did they begin to be conſiderable till great encouragement was given by the legiſlature to the linen manufacture in Scotland. The firſt cauſes of the ſucceſs of this manufacture were the act of parliament in 1748, whereby the wearing of French cambrics was prohibited under ſevere penalties; that of 1751, allowing weavers in flax or hemp to ſettle and exerciſe their trades anywhere in Scotland free from all corporation dues; and the bounty of three halfpence per yard on all linens exported at and under 18d. per yard. Since that time a ſpirit of manufacture has been excited among the inhabitants of Glaſgow; and great variety of goods, and in very great quantity, have been manufactured. Checks, linen, and linen and cotton, are manufactured to a great extent. Printed linens and cottons were begun to be manufactured in 1738; but they only made garments till 1754, when handkerchiefs were firſt printed.

Ineles were firſt made here about the year 1732.—The engine looms uſed at that time were ſo inconvenient, and took up ſo much time in making the goods, that the Dutch, who were the only people poſſeſſed of the large incle looms, were almoſt ſolely in poſſeſſion of this manufacture. Mr Hervey, who began this branch in Glaſgow, was ſo ſenſible of the diſadvantages under which it laboured, that he went over to Holland; and in ſpite of the care and attention which the Dutch took to conceal the methods of manufacturing, he brought over with him from Haerlem two of their looms, and one of their workmen. This Dutchman remained ſome years in Glaſgow; but on ſome diſguſt he went to Mancheſter, and inſtructed the people there in the method of carrying on the manufacture.

In 1757, carpets were begun to be made, and are now carried on to a conſiderable extent. Hunters cloths, blankets, and other goods of the ſame kind, are alſo made.

Beſides theſe, a great variety of articles are manufactured at Glaſgow, of which our limits will not permit us to enter into a detail, ſuch as ſoap, refining of ſugar, ironmongery, braſs, jewellery, glaſs both common and white, pottery, &c. Types for printing are made in this city by Dr Wilſon and Sons, equal, if not ſuperior, in beauty to any others in Britain. Printing of books was firſt begun here by George Anderſon about the year 1638. But there was no good printing in Glaſgow till the year 1735, when Robert Urie printed ſeveral books in a very elegant manner. The higheſt perfection, however, to which printing hath yet been carried in this place, or perhaps in any other, was by the late Robert and Andrew Foulis, (who began in the year 1740); as the many correct and ſplendid editions of books printed by them in different languages ſufficiently teſtify. Some of their claſſics, it is ſaid, are held in ſuch high eſteem abroad, as to ſell nearly at the price of ancient MSS. The ſame gentlemen alſo eſtabliſhed an academy of painting; but the wealth of Scotland being unequal to the undertaking, it has been ſince given up.

Since the ſtagnation of the American trade, already noticed, the merchants of Glaſgow have turned their attention more to manufactures, which have of late, eſpecially that of cottons and muſlins, increaſed in a very rapid degree, and bid fair for putting the city in a more flouriſhing condition than ever it was before. The manufacturing houſes, the influx of people for carrying on the manufactures, the means and encouragement which theſe afford to population, and the wealth thence derived by individuals as well as accruing to the community, have all tended lately to increaſe, and are daily increaſing, the extent of the city, and the elegance of the buildings. Beſides various improvements in the old ſtreets, ſeveral handſome new ones as well as new ſquares have been added. The ſite of theſe new buildings is the tract of riſing ground already mentioned as the north boundary of the town previous to its late extenſion. The weſtern part of it, which is perfectly level, is occupied by a ſpacious ſquare, denominated *George's Square;* two ſides of which are built and inhabited, and a third begun. The graſs plot in the middle is encloſed with a handſome iron railing. The ſquare is deficient in regularity; the houſes on the weſt ſide being a ſtory higher than thoſe of the weſt; but in other reſpects it is very neat. To the eaſt of this ſquare are ſeveral new ſtreets laid out and paved, and ſome of them almoſt completely built on. The principal, though as yet the moſt incomplete of thoſe ſtreets, is Ingram Street, which runs from eaſt to weſt. From this the others begin; ſome of them being carried northward up the hill, others going ſouthward and joining the main ſtreet of the town. One of the fineſt of theſe croſs ſtreets is Hutcheſon Street.

Glaſgow.

29 The river, &c.

The ſouth boundary of the city was mentioned to be the Clyde. Over this river there are two bridges. One of them, the Old Bridge, built about 400 years ago by Archbiſhop Rae, but ſince repaired and partly rebuilt, conſiſts of eight arches; and connects the ſuburb of Gorbals, ſituated on the oppoſite ſide of the river, with the city. The other is the New Bridge, deſcribed above.—On the banks of the river, eaſtward, is the Green, a ſpot appropriated to the uſe of the inhabitants, with conveniences for waſhing and drying linens, and with agreeable and extenſive walks for recreation.

On the ſame or ſouth ſide of the town, weſtward, is the Broomielaw, where the quay is ſituated. Till within theſe few years, the river here and for ſeveral miles diſtance, was ſo ſhallow and ſo obſtructed by ſhoals, as to admit only of ſmall craft from Greenock, Port Glaſgow, and the Highlands; but of late it has been cleared and deepened ſo as to admit veſſels of conſiderable burden; and it is intended to make the depth as nearly equal as poſſible to that of the canal, in order that the veſſels from Ireland and the weſt coaſt may not be induced excluſively to aſcend the weſt end of the canal and deliver their goods at Canal baſon, but may come up Clyde and unload at the Broomielaw.

30 Government, revenue, &c. of the city.

The government of the city of Glaſgow is veſted in a provoſt and three bailies, a dean of guild, deacon conveener, and a treaſurer, with a common council of 13 merchants and 12 mechanics. The provoſt and two of the bailies muſt, by the ſet of the borough, be elected from the merchant rank, and the other bailie from

Glaſgow. from the trades rank, i. e. the mechanics. The provoſt is, from courteſy and cuſtom, ſtyled *lord provoſt*. He is properly lord of the police of the city, preſident of the community, and is *ex officio* a juſtice of the peace for both the borough and county.

Many of the inhabitants of Glaſgow were convinced of the neceſſity of a new ſyſtem of police, a number of years before the ſanction of parliament was obtained for that purpoſe, which was granted in the year 1800. The act veſted the management of the police in the lord provoſt, bailies, dean of guild, deacon convener, and 24 commiſſioners, one being choſen out of each ward into which the city is divided. The object of the bill was to procure an extenſion of the royalty, to pave, light, and clean the ſtreets, for regulating the police, and nominating officers and watchmen, appointing commiſſioners, raiſing funds, and granting certain powers to the magiſtrates and council, town and dean of guild courts, and for ſeveral other purpoſes.

In framing this ſyſtem of police, it has been wiſely provided that the commiſſioners ſhall not enjoy the office for life; nor even for a long period, but upon the ſuppoſition of being re-elected, and that every perſon properly qualified may have a chance for the office, and by conſequence be entitled to a voice in the management of the funds, and in the direction of every thing which reſpects the inſtitution.

In order to raiſe funds for defraying the expence of the police eſtabliſhment, the lord provoſt, magiſtrates and commiſſioners, on the firſt Monday of September, annually aſſeſs all occupiers, renters, or poſſeſſors of dwelling houſes, cellars, ſhops, warehouſes, and other buildings within the royalty, in proportion to the rent of the different ſubjects, of which the following table gives an accurate ſtatement.

On the yearly rent of ſubjects valued at		
4l. and under 6l. ſterling annually,	4d.	per pound.
At 6l. and under 10l.	6d.	do.
At 10l. and under 15l.	9d.	do.
At 15l. and upwards,	10d.	do.

As ſoon as the act paſſed, thoſe gentlemen who were appointed to carry it into execution, began the diſcharge of their duty according to the ſpirit of ſaid act, and the following office-bearers were nominated for that purpoſe; a maſter of police, a clerk of ditto, collector, treaſurer, ſurveyor, together with other 15 officers of police, and 74 watchmen. Theſe have power to bring to juſtice perſons guilty of ſtreet robberies, houſe-breakings, aſſaults, thefts, ſhop-lifting, picking pockets, frequenters of diſorderly houſes; to ſuppreſs mobs and riots; to aſſiſt in extinguiſhing fires, in guarding and watching the ſtreets, and in aſſiſting the magiſtrates in every thing which relates to the police, peace, and good order of the city. Theſe officers have hitherto given general ſatisfaction in the diſcharge of their duty, by ſeeing that the ſtreets are kept clean, well lighted and guarded. In a word, property and perſonal ſafety are put beyond the reach of danger, and the inſtitution promiſes to be of the moſt unſpeakable advantage to the inhabitants at large.

Many whole and elegant ſtreets have of late years been added to it, ſo that its rapid extenſion, increaſing population, and flouriſhing commerce, juſtly entitle it to rank with ſome of the firſt cities in Scotland, or perhaps in the Britiſh empire. Glaſgow.

The revenue of the town ariſes from a duty upon all grain and meal brought into the city (which tax is denominated *the ladies*); from the rents of lands and houſes the property of the community; from an impoſt of two pennies Scots upon every Scots pint of ale or beer brewed, inbrought, or ſold within the city; from certain duties payable out of the markets; from the rents of the ſeats in churches; from the duties of cranage at the quay, at the weigh-houſe, &c. As to the tonnage on the river, the pontage of the bridge, and ſtatute work; theſe, making no part of the city revenue, are kept ſeparate and diſtinct under the management of commiſſioners appointed by act of parliament.

31 Number of inhabitants.

About the time of the Union, the number of inhabitants in Glaſgow was reckoned about 14,000. In 1765, when a new diviſion of the pariſhes took place, they were eſtimated at 28,000. In 1785, when an accurate ſurvey was made, the number was about 36,000; beſides the ſuburbs, containing the Calton, Gorbals, and Anderſton, reckoned about 1000. Since that time, new buildings, as above noticed, have been erected, and the city has become conſiderably more populous, but no exact eſtimate has been made; though it is generally thought that the number of inhabitants cannot at preſent (1806) be computed at much leſs than 86,630, and accordingly they are more than doubled ſince 1791, at which time they only amounted to 41,777.

The climate of Glaſgow, ſimilar to that of moſt other parts of the iſland, is variable; but there are ſome circumſtances peculiar to its local ſituation which tend to affect it more than that of ſome other places nearer the middle of the country. That part of the country in which Glaſgow is ſituated, is almoſt in the narroweſt part of the iſthmus betwixt the Forth and Clyde, from which poſition the air is frequently refreſhed by temperate breezes from the ſea. The wind is ſouth-weſt and weſt for nearly two-thirds of the year, and is ſaturated with vapour in its paſſage acroſs the Atlantic; and the ſky being frequently clouded with it, the heats of ſummer are not ſo intenſe as in ſome other places. Fogs are not ſo common as in the neighbourhood of Edinburgh, and ſevere froſts are ſeldom of long continuance, nor are ſnows either very deep, nor do they lie long. Thunder and lightning are rare about Glaſgow, and ſeldom deſtructive.

The ſoil in the vicinity is partly a rich clay and partly a light ſand. The grain raiſed about the city is not ſufficient for the conſumpt of the inhabitants, but vaſt quantities are brought from Ireland, Ayrſhire, and the eaſt country. While digging the foundation for the Tontine buildings in the midſt of the city, a piece of a boat was found ſeveral feet below the ſurface of the ground, imbedded in ſand and gravel, from which it would appear that the channel of the river had once run in that direction. In Auguſt 1801, while repairing a diviſion of the cathedral, below the pavement oppoſite the pulpit, about two feet deep, part of a human ſkeleton was found, and a gold chain about 30 inches long lying above the bones of the leg. The date on the ſtone was 1599, but the inſcription in the Saxon character was wholly effaced.

The

Glaſgow. Glaſs.

The general character of the people is that of induſtry and attention to buſineſs, by which many of them have ariſen to a ſtate of independence. They were formerly ſaid to be remarkable for ſeverity and apparent ſanctity of manners; but at preſent they are not more diſtinguiſhed in this reſpect than any of their neighbours. The crimes of robbery and houſe-breaking were much more frequent at a former period than they are now; but as theſe were for the moſt part committed by ſtrangers, it would be uncandid on that account to attach blame to the inhabitants: the recent regulations, however, reſpecting the internal police of the city, have nearly put a ſtop to ſuch depredations.

GLASS, a tranſparent, brittle, factitious body, produced from ſand melted in a ſtrong fire with fixed alkaline ſalts, lead, ſlags, &c. till the whole becomes perfectly clear and fine. The word is formed of the Latin *glaſtum*, a plant called by the Greeks *iſatis*, by the Romans *vitrum*; by the ancient Britons *guadum*, and by the Engliſh *woad*. We find frequent mention of this plant in ancient writers, particularly Cæſar, Vitruvius, Pliny, &c. who relate that the ancient Britons painted or dyed their bodies with glaſtum, guadum, vitrum, &c. i. e. with the blue colour procured from this plant. And hence the factitious matter we are ſpeaking of came to be called *glaſs*; as having always ſomewhat of this bluiſhneſs in it.

I Hiſtory of glaſs-making.

At what time the art of glaſs-making was firſt invented, is altogether uncertain. Some imagine it to have been invented before the flood: but of this we have no direct proof, though there is no improbability in the ſuppoſition; for we know, that it is almoſt impoſſible to excite a very violent fire, ſuch as is neceſſary in metallurgic operations, without vitrifying part of the bricks or ſtones wherewith the furnace is built. This indeed might furniſh the firſt hints of glaſs-making; though it is alſo very probable, that ſuch imperfect vitrifications would be obſerved a long time before people thought of making any uſe of them.

Neri traces the antiquity of glaſs as far back as the time of Job. That writer, ſpeaking of the value of wiſdom (chap. xxviii. verſe 17.), ſays, that gold and *cryſtal* cannot equal it. But this word, which Neri will have to ſignify factitious glaſs, is capable of a great many different interpretations, and properly ſignifies only whatever is beautiful or tranſparent. Dr Merret will have the art to be as ancient as that of pottery or the making of bricks, for the reaſons already given, viz. that by all vehement heat ſome imperfect vitrifications are produced. Of this kind undoubtedly was the foſſil glaſs mentioned by Ferant. Imperator. to have been found under ground where great fires had been. But it is evident, that ſuch imperfect vitrifications might have paſſed unnoticed for ages; and conſequently we have no reaſon to conclude from thence, that the art of glaſs-making is of ſuch high antiquity.

The Egyptians boaſt, that this art was taught them by their great Hermes. Ariſtophanes, Ariſtotle, Alexander Aphrodiſeus, Lucretius, and St John the divine, put it out of all doubt that glaſs was uſed in their days. Pliny relates, that it was firſt diſcovered accidentally in Syria, at the mouth of the river Belus, by certain merchants driven thither by a ſtorm at ſea; who being obliged to continue there and dreſs their victuals by making a fire on the ground, where there was great plenty of the herb kali; that plant, burning to aſhes, its ſalts mixed and incorporated with the ſand, or ſtones fit for vitrification, and thus produced glaſs; and that, this accident being known, the people of Sidon in that neighbourhood eſſayed the work, and brought glaſs into uſe; ſince which time the art has been continually improving. Be this as it will, however, the firſt glaſs-houſes mentioned in hiſtory were erected in the city of Tyre, and here was the only ſtaple of the manufacture for many ages. The ſand which lay on the ſhore for about half a mile round the mouth of the river Belus was peculiarly adapted to the making of glaſs, as being neat and glittering; and the wide range of the Tyrian commerce, gave an ample vent for the productions of the furnace. Glaſs.

Mr Nixon, in his obſervations on a plate of glaſs found at Herculaneum, which was deſtroyed A. D. 80, on which occaſion Pliny loſt his life, offers ſeveral probable conjectures as to the uſes to which ſuch plates might be applied. Such plates, he ſuppoſes, might ſerve for *ſpecula* or looking glaſſes; for Pliny, in ſpeaking of Sidon, adds, *ſiquidem etiam ſpecula excogitaverat:* the reflection of images from theſe ancient ſpecula being effected by beſmearing them behind, or tinging them through with ſome dark colour. Another uſe in which they might be employed, was for adorning the walls of their apartments, by way of wainſcot, to which Pliny is ſuppoſed to refer by his *vitreæ cameræ*, lib. xxxvi. cap. 25. § 64. Mr Nixon farther conjectures, that theſe glaſs plates might be uſed for windows, as well as the lamina of *lapis ſpecularis* and *phengites*, which were improvements in luxury mentioned by Seneca and introduced in his time, Ep. xc. However, there is no poſitive authority relating to the uſage of glaſs windows earlier than the cloſe of the third century: *Manifeſtius eſt* (ſays Lactantius*), *mentem eſſe, quæ per oculos ea quæ ſunt oppoſita, tranſpiciat, quaſi per feneſtras lucente vitro aut ſpeculari lapide obductas.*

* *De opif. Dei*, cap. 5.

The firſt time we hear of glaſs made among the Romans was in the reign of Tiberius, when Pliny relates that an artiſt had his houſe demoliſhed for making glaſs malleable, or rather flexible; though Petronius Arbiter, and ſome others, aſſure us, that the emperor ordered the artiſt to be beheaded for his invention.

It appears, however, that before the conqueſt of Britain by the Romans, glaſs-houſes had been erected in this iſland, as well as in Gaul, Spain, and Italy.—Hence, in many parts of the country are to be found amulets of glaſs, having a narrow perforation and thick rim, denominated by the remaining Britons *gleineu naidreedh* or *glaſs adders*, and which were probably in former times uſed as amulets by the druids †. It can ſcarcely be queſtioned that the Britons were ſufficiently well verſed in the manufacture of glaſs, to form out of it many more uſeful inſtruments than the glaſs beads. Hiſtory indeed aſſures us, that they did manufacture a conſiderable quantity of glaſs veſſels. Theſe, like their amulets, were moſt probably green, blue, yellow, or black, and many of them curiouſly ſtreaked with other colours. The proceſs in the manufacture would be nearly the ſame with that of the Gauls or Spaniards. The ſand of their ſhores being reduced to a ſufficient degree of fineneſs by art, was mixed with three-fourths

† See *Anguinum Druidum*.

Glaſs. of its weight of their nitre (much the ſame with our kelp), and both were melted together. The metal was then poured into other veſſels, where it was left to harden into a maſs, and afterwards replaced in the furnace, where it became tranſparent in the boiling, and was afterwards figured by blowing, or modelling in the lath, into ſuch veſſels as they wanted.

It is not probable that the arrival of the Romans would improve the glaſs manufacture among the Britons. The taſte of the Romans at that time was juſt the reverſe of that of the inhabitants of this iſland. The former preferred ſilver and gold to glaſs for the compoſition of their drinking veſſels. They made indeed great improvements in their own at Rome, during the government of Nero. The veſſels then formed of this metal rivalled the bowls of porcelain in their dearneſs, and equalled the cups of cryſtal in their tranſparency. But theſe were by far too coſtly for common uſe; and therefore, in all probability, were never attempted in Britain. The glaſs commonly made uſe of by the Romans was of a quality greatly inferior; and, from the fragments which have been diſcovered at the ſtations or towns of either, appear to have conſiſted of a thick, ſometimes white, but moſtly blue green, metal.

According to venerable Bede, artificers ſkilled in making glaſs for windows were brought over into England in the year 674, by Abbot Benedict, who were employed in glazing the church and monaſtery of Weremouth. According to others, they were firſt brought over by Wilfrid, biſhop of Worceſter, about the ſame time. Till this time the art of making ſuch glaſs was unknown in Britain; though glaſs windows did not begin to be common before the year 1180; till this period they were very ſcarce in private houſes, and conſidered as a kind of luxury, and as marks of great magnificence. Italy had them firſt, next France, from whence they came into England.

Venice, for many years, excelled all Europe in the fineneſs of its glaſſes; and in the thirteenth century, the Venetians were the only people that had the ſecret of making cryſtal looking glaſſes. The great glaſs works were at Muran, or Murano, a village near the city, which furniſhed all Europe with the fineſt and largeſt glaſſes.

The glaſs manufacture was firſt begun in England in 1557: the finer ſort was made in the place called Crutched Friars, in London; the fine flint glaſs, little inferior to that of Venice, was firſt made in the Savoy houſe, in the Strand, London. This manufacture appears to have been much improved in 1635, when it was carried on with ſea coal or pit coal inſtead of wood, and a monopoly was granted to Sir Robert Manſell, who was allowed to import the fine Venetian flint glaſſes for drinking, the art of making which was not brought to perfection before the reign of William III. But the firſt glaſs plates, for looking glaſſes and coach windows, were made, 1673, at Lambeth, by the encouragement of the duke of Buckingham; who, in 1670, introduced the manufacture of fine glaſs into England, by means of Venetian artiſts, with amazing ſucceſs. So that within a century paſt, the French and Engliſh have not only come up to, but even ſurpaſſed the Venetians, and we are now no longer ſupplied from abroad.

The French made a conſiderable improvement in the art of glaſs, by the invention of a method to caſt very large plates, till then unknown, and ſcarce practiſed yet by any but themſelves and the Engliſh. That court Glaſs. applied itſelf with a laudable induſtry to cultivate and improve the glaſs manufacture. A company of glaſsmen was eſtabliſhed by letters patent; and it was provided by an arret, not only that the working in glaſs ſhould not derogate any thing from nobility, but even that none but nobles ſhould be allowed to work therein.

An extenſive manufactory of this elegant and valuable branch of commerce was firſt eſtabliſhed in Lancaſhire, about the year 1773, through the ſpirited exertions of a very reſpectable body of proprietors, who were incorporated by an act of parliament. From thoſe various difficulties conſtantly attendant upon new undertakings, when they have to contend with powerful foreign eſtabliſhments, it was for ſome time conſiderably embarraſſed; but government, of late, having taken off ſome reſtrictions that bore hard upon it, and made ſome judicious regulations relative to the mode of levying the exciſe duty, it now bids fair to rival, if not ſurpaſs, the moſt celebrated continental manufactures, both with reſpect to the quality, brilliancy, and ſize of its productions.

2 Theory of vitrification uncertain.

With regard to the theory of vitrification, we are almoſt totally in the dark. In general, it ſeems to be that ſtate in which ſolid bodies are, by the vehement action of fire, fitted for being diſſipated or carried off in vapour. In all vitrifications there is a plentiful evaporation: and if any ſolid ſubſtance is carried off in vapour by the intenſe heat of a burning ſpeculum, a vitrification is always obſerved previouſly to take place. The difference, then, between the ſtate of fuſion and vitrification of a ſolid body we may conceive to be, that in the former the element of fire acts upon the parts of the ſolid in ſuch a manner as only to disjoin them, and render the ſubſtance fluid; but in vitrification the fire not only disjoins the particles, but combines with them in a latent ſtate into a third ſubſtance; which, having now as much fire as it can contain, can receive no further change from that element except being carried off in vapour.

But though we are unable to effect this change upon ſolid bodies without a very violent heat, it is otherwiſe in the natural proceſſes. By what we call *cryſtallization*, nature produces more perfect glaſſes than we can make with our furnaces. Theſe are called *precious ſtones;* but in all trials they diſcover the eſſential properties of glaſs, and not of ſtones. The moſt diſtinguiſhing property of glaſs is its reſiſting the force of fire, ſo that this element cannot calcine or change it as it does other bodies, but can only melt it, and then carry it off in vapours. To this laſt all the precious ſtones are ſubject. The diamond (the hardeſt of them all) may be diſſipated in a leſs degree of heat than what would diſſipate common glaſs. Nor can it be any objection to this idea, that ſome kinds of glaſs are capable of being converted into a kind of porcelain by a long-continued cementation with certain materials. This change happens only to thoſe kinds of glaſs which are made of alkaline ſalt and ſand; and Dr Lewis hath ſhown that this change is produced by the diſſipation of the ſaline principle, which is the leaſt fixed of the two. Glaſs, therefore, we may ſtill conſider as a ſubſtance upon which the fire

has

Glaſs. has no other effect than either to melt or diſſipate it in vapour.

The other properties of glaſs are very remarkable, ſome of which follow:

3 Remarkable properties of glaſs.

1. It is one of the moſt elaſtic bodies in nature. If the force with which glaſs balls ſtrike each other be reckoned 16, that wherewith they recede by virtue of their elaſticity will be nearly 15.

2. When glaſs is ſuddenly cooled, it becomes exceedingly brittle; and this brittleneſs is ſometimes attended with very ſurpriſing phenomena. Hollow balls made of unannealed glaſs, with a ſmall hole in them, will fly to pieces by the heat of the hand only, if the hole by which the internal and external air communicate be ſtopped with a finger. Some veſſels, however, made of ſuch unannealed glaſs have been diſcovered, which have the remarkable property of reſiſting very hard ſtrokes given from without, though they ſhiver to pieces by the ſhocks received from the fall of very light and minute bodies dropped into their cavities. Theſe glaſſes may be made of any ſhape: all that needs be obſerved in making them is, that their bottom be thicker than their ſides. The thicker the bottom is, the eaſier do the glaſſes break. One whoſe bottom is three fingers breadth in thickneſs flies with as much eaſe at leaſt as the thinneſt glaſs. Some of theſe veſſels have been tried with ſtrokes of a mallet ſufficient to drive a nail into wood tolerably hard, and have held good without breaking. They have alſo reſiſted the ſhock of ſeveral heavy bodies, let fall into their cavities, from the height of two or three feet; as muſket balls, pieces of iron or other metal, pyrites, jaſper, wood, bone, &c. But this is not ſurpriſing, as other glaſſes of the ſame ſhape and ſize will do the ſame: but the wonder is, that taking a ſhiver of flint of the ſize of a ſmall pea, and letting it fall into the glaſs only from the height of three inches, in about two ſeconds the glaſs flies, and ſometimes at the very moment of the ſhock; nay, a bit of flint no larger than a grain, dropped into ſeveral glaſſes ſucceſſively, though it did not immediately break them, yet when ſet by, they all flew in leſs than three quarters of an hour. Some other bodies produce the ſame effect with flint; as ſapphire, diamond, porcelain, hard tempered ſteel; alſo marbles ſuch as boys play with, and likewiſe pearls.

4 Surpriſing fragility of unannealed glaſs.

Theſe experiments were made before the Royal Society; and ſucceeded equally when the glaſſes were held in the hand, when they were reſted on a pillow, put in water, or filled with water. It is alſo remarkable, that the glaſſes broke upon having their bottoms ſlightly rubbed with the finger, though ſome of them did not fly till half an hour after the rubbing. If the glaſſes are everywhere extremely thin, they do not break in theſe circumſtances.

5 Attempts to account for it.

Some have pretended to account for theſe phenomena, by ſaying, that the bodies dropped into the veſſels cauſe a concuſſion which is ſtronger than the coheſive force of the glaſs, and conſequently that a rupture muſt enſue. But why does not a ball of iron, gold, ſilver, or copper, which are perhaps a thouſand times heavier than the flint, produce the ſame effect? It is becauſe they are not elaſtic. But ſurely iron is more elaſtic than the end of one's finger. Mr Euler has endeavoured to account for theſe appearances from his principles of percuſſion. He thinks that this experiment entirely overthrows the opinion of thoſe who meaſure the force of percuſſion by the *vis viva*, or abſolute apparent ſtrength of the ſtroke. According to his principles, the great hardneſs and angular figure of the flint, which makes the ſpace of contact with the glaſs extremely ſmall, ought to cauſe an impreſſion on the glaſs vaſtly greater than lead, or any other metal; and this may account for the flint's breaking the veſſel, though the bullet, even falling from a conſiderable height, does no damage. Hollow cups made of green bottle glaſs, ſome of them three inches thick at the bottom, were inſtantly broken by a ſhiver of flint weighing about two grains, though they had reſiſted the ſhock of a muſket ball from the height of three feet. Glaſs.

That Mr Euler's theory cannot be concluſive more than the other, muſt appear evident from a very ſlight conſideration. It is not by angular bodies alone that the glaſſes are broken. The marbles with which children play are round, and yet they have the ſame effect with the angular flint. Beſides, if it was the mere force of percuſſion which broke the glaſſes, undoubtedly the fracture would always take place at the very inſtant of the ſtroke; but we have ſeen that this did not happen ſometimes till a very conſiderable ſpace of time had elapſed. It is evident, therefore, that this effect is occaſioned by the putting in motion ſome ſubtle fluid with which the ſubſtance of the glaſs is filled; and that the motions of this fluid, when once excited in a particular part of the glaſs, ſoon propagate themſelves through the whole or greateſt part of it, by which means the coheſive power becomes at laſt too weak to reſiſt them. There can be little doubt that the fluid juſt now mentioned is that of electricity. It is known to exiſt in glaſs in very great quantity; and it alſo is known to be capable of breaking glaſſes even when annealed with the greateſt care, if put into too violent a motion. Probably the cooling of glaſs haſtily may make it more electric than is conſiſtent with its coheſive power, ſo that it is broken by the leaſt increaſe of motion in the electric fluid by friction or otherwiſe. This is evidently the caſe when it is broken by rubbing with the finger; but why it ſhould alſo break by the mere contact of flint and the other bodies above mentioned, has not yet been ſatisfactorily accounted for.

6 Rotation of glaſs tubes before a fire.

A moſt remarkable phenomenon alſo is produced in glaſs tubes placed in certain circumſtances. When theſe are laid before a fire in a horizontal poſition, having their extremities properly ſupported, they acquire a rotatory motion round their axis, and alſo a progreſſive motion towards the fire, even when their ſupports are declining from the fire, ſo that the tubes will move a little way up hill towards the fire. When the progreſſive motion of the tubes towards the fire is ſtopped by any obſtacle, their rotation ſtill continues. When the tubes are placed in a nearly upright poſture, leaning to the right hand, the motion will be from eaſt to weſt; but if they lean to the left hand, their motion will be from weſt to eaſt; and the nearer they are placed to the perfectly upright poſture, the leſs will the motion be either way.

If the tube is placed horizontally on a glaſs pane, the fragment, for inſtance, of coach window-glaſs, inſtead

Glaſs. ſtead of moving towards the fire, it will move from it, and about its axis in a contrary direction to what it had done before; nay, it will recede from the fire, and move a little up hill when the plane inclines towards the fire. Theſe experiments are recorded in the Philoſophical Tranſactions *. They ſucceeded beſt with tubes about 20 or 22 inches long, which had in each end a pretty ſtrong pin fixed in cork for an axis.

* N° 476. § 1.

7 Attempts to account for it,

The reaſon given for theſe phenomena, is the ſwelling of the tubes towards the fire by the heat, which is known to expand all bodies. For, ſay the adopters of this hypotheſis, granting the exiſtence of ſuch a ſwelling, gravity muſt pull the tube down when ſupported near its extremities; and a freſh part being expoſed to the fire, it muſt alſo ſwell out and fall down, and ſo on.—But without going farther in the explanation of this hypotheſis, it may be here remarked, that the fundamental principle on which it proceeds is falſe; for though fire indeed make bodies expand, it does not increaſe them in weight; and therefore the ſides of the tube, though one of them is expanded by the fire, muſt ſtill remain *in equilibrio;* and hence we muſt conclude, that the cauſes of theſe phenomena remain yet to be diſcovered.

4. Glaſs is leſs dilatable by heat than metalline ſubſtances, and ſolid glaſs ſticks are leſs dilatable than tubes. This was firſt diſcovered by Col. Roy, in making experiments in order to reduce barometers to a greater degree of exactneſs than hath hitherto been found practicable; and ſince his experiments were made, one of the tubes 18 inches long, being compared with a ſolid glaſs rod of the ſame length, the former was found by a pyrometer to expand four times as much as the other, in a heat approaching to that of boiling oil.—On account of the general quality which glaſs has of expanding leſs than metal, M. de Luc recommends it to be uſed in pendulums: and he ſays it has alſo this good quality, that its expanſions are always equable, and proportioned to the degrees of heat; a quality which is not to be found in any other ſubſtance yet known.

Phil Tranſ. vol. lxvii. p. 663.

Ibid. vol. lxviii p. 474.

5. Glaſs appears to be more fit for the condenſation of vapours than metallic ſubſtances. An open glaſs filled with water, in the ſummer time, will gather drops of water on the outſide, juſt as far as the water in the inſide reaches; and a perſon's breath blown on it manifeſtly moiſtens it. Glaſs alſo becomes moiſt with dew, when metals do not. See Dew.

6. A drinking glaſs partly filled with water, and rubbed on the brim with a wet finger, yields muſical notes, higher or lower as the glaſs is more or leſs full; and will make the liquor friſk and leap. See Harmonica.

7. Glaſs is poſſeſſed of very great electrical virtues. See Electricity, *paſſim.*

8 Materials for glaſs.

Materials for Making of GLASS. The materials whereof glaſs is made, we have already mentioned to be ſalt and ſand or ſiliceous earth.

1. The ſalt here uſed is procured from a ſort of aſhes brought from the Levant, called *polverine*, or *rochetta;* which aſhes are thoſe of a ſort of water plant called *kali*†, cut down in the ſummer, dried in the ſun, and burnt in heaps, either on the ground or on iron grates; the aſhes falling into a pit, grow into a hard maſs, or ſtone, fit for uſe. It may alſo be procured from common kelp, or the aſhes of the *fucus veſiculoſus*. See Kelp. Glaſs.

† See *Salſola, Botany Index.*

To extract the ſalt, theſe aſhes, or polverine, are powdered and ſifted, then put into boiling water, and there kept till one-third of the water be conſumed; the whole being ſtirred up from time to time, that the aſhes may incorporate with the fluid, and all its ſalts be extracted: then the veſſel is filled up with new water, and boiled over again, till one half be conſumed; what remains is a ſort of ley, ſtrongly impregnated with ſalt. This ley, boiled over again in freſh coppers, thickens in about 24 hours, and ſhoots its ſalt; which is to be ladled out, as it ſhoots, into earthen pans, and thence into wooden vats to drain and dry. This done, it is groſsly pounded, and thus put in a ſort of oven, called *calcar*, to dry. It may be added, that there are other plants, beſides kali and fucus, which yield a ſalt fit for glaſs: ſuch are the common way thiſtle, bramble, hops, wormwood, woad, tobacco, fern, and the whole leguminous tribe, as peaſe, beans, &c.

Pearl aſhes form a leading flux in the manufacture of glaſs, and moſtly ſupply the place of the Levant aſhes, the barillas of Spain, and many other kinds, which were formerly brought here for making both glaſs and ſoap.

There are other fluxes uſed for different kinds of glaſs, and for various purpoſes, as calcined lead, nitre, ſea ſalt, borax, arſenic, ſmiths clinkers, and wood-aſhes, containing the earth and lixiviate ſalts as produced by incineration. With regard to theſe ſeveral fluxes, we may obſerve, in general, that the more calx of lead, or other metallic earth, enters into the compoſition of any glaſs, ſo much the more fuſible, ſoft, coloured, and denſe this glaſs is, and reciprocally.

The colours given to glaſs by calces of lead, are ſhades of yellow: on the other hand, glaſſes that contain only ſaline fluxes partake of the properties of ſalts; they are leſs heavy, leſs denſe, harder, whiter, more brilliant, and more brittle than the former; and glaſſes containing both ſaline and metallic fluxes do alſo partake of the properties of both theſe ſubſtances. Glaſſes too ſaline are eaſily ſuſceptible of alteration by the action of air and water: eſpecially thoſe in which alkalies prevail; and theſe are alſo liable to be injured by acids. Thoſe that contain too much borax and arſenic, though at firſt they appear very beautiful, quickly tarniſh and become opake when expoſed to air. By attending to theſe properties of different fluxes, phlogiſtic or ſaline, the artiſt may know how to adjuſt the proportions of theſe to ſand, or powdered flints, for the various kinds of glaſs. See the article Vitrification.

2. The ſand or ſtone, called by the artiſts *tarſo*, is the ſecond ingredient in glaſs, and that which gives it the body and firmneſs. Theſe ſtones, Agricola obſerves, muſt be ſuch as will fuſe; and of theſe ſuch as are white and tranſparent are beſt; ſo that cryſtal challenges the precedency of all others.

At Venice they chiefly uſe a ſort of pebble, found in the river Teſino, reſembling white marble, and called *cuogolo*. Indeed Ant. Neri aſſures us, that all ſtones which will ſtrike fire with ſteel, are fit to vitrify; but Dr Morret ſhows, that there are ſome exceptions from this

Glaſs. this rule. Flints are admirable; and when calcined, powdered, and ſearced, make a pure white cryſtalline metal; but the expence of preparing them makes the maſters of our glaſs-houſes ſparing of their uſe. Where proper ſtones cannot be ſo conveniently had, ſand is uſed. The beſt for this purpoſe is that which is white, ſmall, and ſhining; examined by the microſcope, it appears to be ſmall fragments of rock cryſtal. For green glaſs, that which is of a ſoft texture, and more gritty; it is to be well waſhed, which is all the preparation it needs. Our glaſs-houſes are furniſhed with white ſand for their cryſtal glaſſes from Lynn in Norfolk, and Maidſtone in Kent, and with the coarſer for green glaſs from Woolwich.

Some mention a third ingredient in glaſs, viz. manganeſe, a kind of pſeudo loadſtone, dug up in Germany, Italy, and even in Mendip hills in Somerſetſhire. But the proportion hereof to the reſt is very inconſiderable; beſide, that it is not uſed in all glaſs. Its office is to purge off the natural greeniſh colour, and give it ſome other tincture required.

For this purpoſe it ſhould be choſen of a deep colour, and free from ſpecks of metalline appearance, or a lighter caſt; manganeſe requires to be well calcined in a hot furnace, and then to undergo a thorough levigation. The effect of manganeſe in deſtroying the colours of glaſs, and hence called the ſoap of glaſs, is accounted for by M. Montamy, in his *Traité des Couleurs pour la Peinture en Email*, in the following manner: the manganeſe deſtroys the green, olive, and blue colours of glaſs, by adding to them a purple tinge, and by the mixture producing a blackiſh brown colour; and as blackneſs is cauſed merely by an abſorption of the rays of light, the blackiſh tinge given to the glaſs by the mixture of colours, prevents the reflection of ſo many rays, and thus renders the glaſs leſs coloured than before. But the black produced by this ſubſtance ſuggeſts an obvious reaſon for uſing it very ſparingly in thoſe compoſitions of glaſs which are required to be very tranſparent. Nitre or ſaltpetre is alſo uſed with the ſame intention; for by deſtroying in a certain degree the inflammable or carbonaceous matter which gives a ſtrong tinge of yellow to glaſs prepared with lead as a flux, it ſerves to free it from this colour; and in ſaline glaſſes, nitre is requiſite in a ſmaller proportion to render them ſufficiently tranſparent, as in the caſe of looking glaſs and other kinds of plates.

Kinds of GLASS. The manufactured glaſs now in uſe may be divided into three general kinds; white tranſparent glaſs, coloured glaſs, and common green or bottle glaſs. Of the firſt kind there is a great variety; as the flint glaſs, as it is called with us, and the German cryſtal glaſs, which are applied to the ſame uſes; the glaſs for plates, for mirrors, or looking glaſſes; the glaſs for windows and other lights; and the glaſs for phials and ſmall veſſels. And theſe again differ in the ſubſtances employed as fluxes in forming them, as well as in the coarſeneſs or fineneſs of ſuch as are uſed for their body. The flint and cryſtal, mirror and beſt window glaſs, not only require ſuch purity in the fluxes, as may render it practicable to free the glaſs perfectly from all colour; but for the ſame reaſon likewiſe, either the white Lynn ſand, calcined flints, or white pebbles, ſhould be uſed. The others do not demand the ſame nicety in the choice of the materials; though the ſecond kind of window glaſs, and the beſt kind of phial, will not be ſo clear as they ought, if either too brown ſand or impure ſalts be ſuffered to enter into their compoſition. Glaſs.

Of coloured glaſs there is a great variety of ſorts, differing in their colour or other properties according to the occaſions for which they are wanted. The differences in the latter kind depend on the accidental preparation and management of the artiſts by whom they are manufactured, as will be afterwards explained.

Furnaces for the Making of GLASS. In this manufacture there are three ſorts of furnaces; one called *calcar* is for the frit; the ſecond is for working the glaſs; the third ſerves to anneal the glaſs, and is called the *leer*. See Plate CCXLVII.

The calcar reſembles an oven ten feet long, ſeven feet broad, and two deep; the fuel, which in Britain is ſea coal, is put into a trench on one ſide of the furnace, and the flame reverberating from the roof upon the frit calcines it. The glaſs furnace, or working furnace, is round, of three yards diameter, and two high: or thus proportioned. It is divided into three parts, each of which is vaulted. The lower part is properly called the *crown*, and is made in that form. Its uſe is to keep a briſk fire, which is never put out. The mouth is called the *bocca*. There are ſeveral holes in the arch of this crown, through which the flame paſſes into the ſecond vault or partition, and reverberates into the pots filled with the ingredients above mentioned. Round the inſides are eight or more pots placed, and piling pots on them. The number of pots is always double that of the boccas or mouths, or of the number of workmen, that each may have one pot refined to work out of, and another for metal to refine in while he works out of the other. Through the working holes the metal is taken out of the pots, and the pots are put into the furnace; and theſe holes are ſtopped with moveable covers made of lute and brick, to ſcreen the workmen's eyes from the ſcorching flames. On each ſide of the bocca or mouth is a bocarella or little hole, out of which coloured glaſs or finer metal is taken from the piling pot. Above this oven there is the third oven or *leer*, above five or ſix yards long, where the veſſels or glaſs are annealed or cooled: this part conſiſts of a tower, beſides the leer, into which the flame aſcends from the furnace. The tower has two mouths, through which the glaſſes are put in with a fork, and ſet on the floor or bottom: but they are drawn out on iron pans called *fraches*, through the leer, to cool by degrees; ſo that they are quite cold by the time they reach the mouth of the leer, which enters the ſaroſel or room where the glaſſes are to be ſtowed.

But the green-glaſs furnace is ſquare; and at each angle it has an arch for annealing or cooling glaſſes. The metal is wrought on two oppoſite ſides, and on the other two they have their colours, into which are made linnet holes for the fire to come from the furnace to bake the frit, and to diſcharge the ſmoke. Fires are made in the arches to anneal the work, ſo that the whole proceſs is done in one furnace.

Theſe furnaces muſt not be of brick, but of hard ſandy ſtones. In France, they build the outſide of brick; and the inner part, to bear the fire, is made of a ſort

Glaſs. ſort of fullers earth, or tobacco-pipe clay, of which earth they alſo make their melting pots. In Britain the pots are made of Stourbridge clay.

Mr Blancourt obſerves that the worſt and rougheſt work in this art is the changing the pots when they are worn out or cracked. In this caſe the great working hole muſt be uncovered; the faulty pot muſt be taken out with iron hooks and forks, and a new one muſt be ſpeedily put in its place, through the flames, by the hands only. For this work, the man guards himſelf with a garment made of ſkins, in the ſhape of a pantaloon, that covers him all but his eyes, and is made as wet as poſſible; the eyes are defended with a proper ſort of glaſs.

Inſtruments for Making of GLASS. The inſtruments made uſe of in this work may be reduced to theſe that follow. A blowing pipe, made of iron, about two feet and a half long, with a wooden handle. An iron rod to take up the glaſs after it is blown, and to cut off the former. Sciſſars to cut the glaſs when it comes off from the firſt hollow iron. Shears to cut and ſhape great glaſſes, &c. An iron ladle with the end of the handle caſed with wood, to take the metal out of the refining pot, to put it into the workman's pots. A ſmall iron ladle caſed in the ſame manner, to ſkim the alkalic ſalt that ſwims at top. Shovels, one like a peel, to take up the great glaſſes; another like a fire-ſhovel, to feed the furnace with coals. A hooked iron fork, to ſtir the matter in the pots. An iron rake for the ſame purpoſe, and to ſtir the frit. An iron fork, to change or pull the pots out of the furnace, &c.

Compoſitions for White and Cryſtal GLASS. 1. To make *cryſtal glaſs*, take of the whiteſt tarſo, pounded ſmall, and ſearced as fine as flour, 200 pounds; of the ſalt of polverine 130 pounds; mix them together and put them into the furnace called the *calcar*, firſt heating it. For an hour keep a moderate fire, and keep ſtirring the materials with a proper rake, that they may incorporate and calcine together; then increaſe the fire for five hours; after which take out the matter; which being now ſufficiently calcined, is called *frit*. From the calcar put the frit in a dry place, and cover it up from the duſt for three or four months. Now to make the glaſs or cryſtal: take of this cryſtal frit, called alſo *bollito*; ſet it in pots in the furnace, adding to it a due quantity of magneſia or manganeſe: when the two are fuſed, caſt the fluor into fair water, to clear it of the ſalt called *ſandiver*; which would otherwiſe make the cryſtal obſcure and cloudy. This lotion muſt be repeated again and again, as often as needful, till the cryſtal be fully purged; or this ſcum may be taken off by means of proper ladles. Then ſet it to boil four, five or ſix days; which done, ſee whether it have manganeſe enough; and if it be yet greeniſh, add more manganeſe, at diſcretion, by little and little at a time, taking care not to overdoſe it, becauſe the manganeſe inclines it to a blackiſh hue. Then let the metal clarify, till it becomes of a clear and ſhining colour; which done, it is fit to be blown or formed into veſſels at pleaſure.

2. *Flint glaſs*, as it is called by us, is of the ſame general kind with that which in other places is called cryſtal glaſs. It has this name from being originally made with calcined flints, before the uſe of the white ſand was underſtood; and retains the name, though no flints are now uſed in the compoſition of it. This flint glaſs differs from the other, in having lead for its flux, and white ſand for its body; whereas the fluxes uſed for the cryſtal glaſs are ſalts or arſenic, and the body conſiſts of calcined flints or white river pebbles, tarſo, or ſuch ſtones. To the white ſand and lead a proper proportion of nitre is added, to burn away the phlogiſton of the lead, and alſo a ſmall quantity of magneſia; and in ſome works they uſe a proportional quantity of arſenic to aid the fluxing ingredients. The moſt perfect kind of glaſs may be made by fuſing with a very ſtrong fire 120 pounds of the white ſand, 50 pounds of red lead, 40 pounds of the beſt pearl aſhes, 20 pounds of nitre, and five ounces of magneſia. Another compoſition of flint glaſs, which is ſaid to come nearer to the kind now made, is the following: 120 pounds of ſand, 54 pounds of the beſt pearl aſhes, 36 pounds of red lead, 12 pounds of nitre, and 6 ounces of magneſia. To either of theſe a pound or two of arſenic may be added, to increaſe the flux of the compoſition. A cheaper compoſition of flint glaſs may be made with 120 pounds of white ſand, 35 pounds of the beſt pearl aſhes, 40 pounds of red lead, 13 pounds of nitre, 6 pounds of arſenic, and four ounces of magneſia; or inſtead of the arſenic may be ſubſtituted 15 pounds of common ſalt; but this will be more brittle than the other. The cheapeſt compoſition for the worſt kind of flint glaſs conſiſts of 120 pounds of white ſand, 30 pounds of red lead, 20 pounds of the beſt pearl aſhes, 10 pounds of nitre, 15 pounds of common ſalt, and ſix pounds of arſenic. The beſt German cryſtal glaſs is made of 120 pounds of calcined flints or white ſand, 70 pounds of the beſt pearl aſhes, 10 pounds of ſaltpetre, half a pound of arſenic, and five ounces of magneſia. And a cheaper compoſition is formed of 120 pounds of calcined flints or white ſand, 46 pounds of pearl aſhes, 7 pounds of nitre, 6 pounds of arſenic, and 5 ounces of magneſia.

A glaſs much harder than any prepared in the common way, may be made by means of borax in the following method: Take four ounces of borax, and an ounce of fine ſand; reduce both to a ſubtile powder, and melt them together in a large cloſe crucible ſet in a wind furnace, keeping up a ſtrong fire for half an hour; then take out the crucible, and when cold break it, and there will be found at the bottom a pure hard glaſs capable of cutting common glaſs like a diamond. This experiment, duly varied, ſays Dr Shaw, may lead to ſeveral uſeful improvements in the arts of glaſs, enamels, and factitious gems, and ſhows an expeditious method of making glaſs, without any fixed alkali, which has been generally thought an eſſential ingredient in glaſs, and it is not yet known whether calcined cryſtal or other ſubſtances being added to this ſalt inſtead of ſand, it might not make a glaſs approaching to the nature of a diamond.

There are three principal kinds of glaſſes, diſtinguiſhed by the form or manner of working them; viz. I. *Round glaſs*, as thoſe of our veſſels, phials, drinking glaſſes, &c. II. *Table* or *window glaſs*, of which there are divers kinds; viz. crown glaſs, jealous glaſs, &c. III. *Plate glaſs*, or *mirror glaſs*.

I. *Working or Blowing Round* GLASS. The working furnace, we have obſerved, is round and has ſix boccas

or

Glaſs. or apertures: at one of theſe, called the *great bocca*, the furnace is heated, and the pots of frit are at this ſet in the furnace; two other ſmall holes, called *bocarellas*, ſerve to lade or take out the melted metal, at the end of an iron, to work the glaſs. At the other holes they put in pots of fuſible ingredients, to be prepared, and at laſt emptied into the lading pot.

There are ſix pots in each furnace, all made of tobacco-pipe clay, proper to ſuſtain not only the heat of the fire, but alſo the effect of the polverine, which penetrates every thing elſe. There are only two of theſe pots that work: the reſt ſerve to prepare the matter for them. The fire of the furnace is made and kept up with dry hard wood, caſt in without intermiſſion at ſix apertures.

When the matter contained in the two pots is ſufficiently vitrified, they proceed to blow or faſhion it. For this purpoſe the workman dips his blowing pipe into the melting pot; and by turning it about, the metal ſticks to the iron more firmly than turpentine. This he repeats four times, at each time rolling the end of his inſtrument, with the hot metal thereon, on a piece of plate iron; over which is a veſſel of water which helps to cool, and ſo to conſolidate and to diſpoſe that matter to bind more firmly with what is to be taken next out of the melting pot. But after he has dipt a fourth time, and the workman perceives there is metal enough on the pipe, he claps his mouth immediately to the other end of it, and blows gently through the iron tube, till the metal lengthens like a bladder about a foot. Then he rolls it on a marble ſtone a little while to poliſh it; and blows a ſecond time, by which he brings it to the ſhape of a globe of about 18 or 20 inches diameter. Every time he blows into the pipe, he removes it quickly to his cheek; otherwiſe he would be in danger, by often blowing, of drawing the flame into his mouth: and this globe may be flattened by returning it to the fire; and brought into any form by ſtamp irons, which are always ready. When the glaſs is thus blown, it is cut off at the collet or neck; which is the narrow part that ſtuck to the iron. The method of performing this is as follows: the pipe is reſted on an iron bar, cloſe by the collet; then a drop of cold water being laid on the collet, it will crack about a quarter of an inch, which, with a ſlight blow or cut of the ſhears will immediately ſeparate the collet.

After this is done, the operator dips the iron rod into the melting pot, by which he extracts as much metal as ſerves to attract the glaſs he has made, to which he now fixes this rod at the bottom of his work, oppoſite to the opening made by the breaking of the collet. In this poſition the glaſs is carried to the great bocca or mouth of the oven, to be heated and ſcalded; by which means it is again put into ſuch a ſoft ſtate, that, by the help of an iron inſtrument, it can be pierced, opened, and widened, without breaking. But the veſſel is not finiſhed till it is returned to the great bocca; where being again heated thoroughly, and turned quickly about with a circular motion, it will open to any ſize, by the means of the heat and motion.

If there remain any ſuperfluities, they are cut off with the ſhears; for till the glaſs is cool, it remains in a ſoft flexible ſtate. It is therefore taken from the bocca, and carried to an earthen bench, covered with brands, which are coals extinguiſhed, keeping it turning; becauſe that motion prevents any ſettling, and preſerves an evenneſs in the face of the glaſs, where, as it cools, it comes to its conſiſtency; being firſt cleared from the iron rod by a ſlight ſtroke by the hand of the workman. Glaſs.

If the veſſel conceived in the workman's mind, and whoſe body is already made, requires a foot, or a handle, or any other member or decoration, he makes them ſeparately; and now eſſays to join them with the help of hot metal, which he takes out of the pots with his iron rod: but the glaſs is not brought to its true hardneſs till it has paſſed the leer or annealing oven, deſcribed before.

II. *Working or blowing of Window or Table* GLASS. The method of working round glaſs, or veſſels of any ſort, is in every particular applicable to the working of window or table glaſs, till the blowing iron has been dipt the fourth time. But then inſtead of rounding it, the workman blows, and ſo manages the metal upon the iron plate, that it extends two or three feet in the form of a cylinder. This cylinder is put again to the fire, and blown a ſecond time, and is thus repeated till it is extended to the dimenſions required, the ſide to which the pipe is fixed diminiſhing gradually till it ends in a pyramidal form; ſo that, to bring both ends nearly to the ſame diameter, while the glaſs is thus flexible, he adds a little hot metal to the end oppoſite the pipe, and draws it out with a pair of iron pincers, and immediately cuts off the ſame end with the help of a little cold water as before.

The cylinder being now open at one end, is carried back to the bocca; and there, by the help of cold water, it is cut about eight or ten inches from the iron pipe or rod; and the whole length at another place, by which alſo it is cut off from the iron rod. Then it is heated gradually on an earthen table, by which it opens in length; while the workman, with an iron tool, alternately lowers and raiſes the two halves of the cylinder; which at laſt will open like a ſheet of paper, and fall into the ſame flat form in which it ſerves for uſe; in which it is preſerved by heating it over again, cooling it on a table of copper, and hardening it 24 hours in the annealing furnace, to which it is carried upon forks. In this furnace an hundred tables of glaſs may lie at a time, without injury to each other, by ſeparating them into tents, with an iron ſhiver between, which diminiſhes the weight by dividing it, and keeps the tables flat and even.

Of window or table glaſs there are various ſorts, made in different places, for the uſe of building. Thoſe moſt known among us are given us by the author of the Builder's Dictionary, as follows:

1. *Crown*, of which, ſays Neri, there are two kinds, diſtinguiſhed by the places where they are wrought; viz. Ratcliff crown glaſs, which is the beſt and cleareſt, and was firſt made at the Bear garden, on the Bankſide, Southwark, but ſince at Ratcliff: of this there are 24 tables to the caſe, the tables being of a circular form, about three feet ſix inches in diameter. The other kind, or Lambeth crown glaſs, is of a darker colour than the former, and more inclining to green.

The beſt window or crown glaſs is made of white ſand 60 pounds, of purified pearl aſhes 30 pounds, of ſaltpetre

Glaſs. ſaltpetre 15 pounds, of borax one pound, and of arſenic half a pound. If the glaſs ſhould prove yellow, magneſia muſt be added. A cheaper compoſition for window glaſs conſiſts of 60 pounds of white ſand, 25 pounds of unpurified pearl aſhes, 10 pounds of common ſalt, 5 pounds of nitre, 2 pounds of arſenic, and one ounce and a half of magneſia. The common or green window glaſs is compoſed of 60 pounds of white ſand, 30 pounds of unpurified pearl aſhes, 10 pounds of common ſalt, 2 pounds of arſenic, and 2 ounces of magneſia. But a cheaper compoſition for this purpoſe conſiſts of 120 pounds of the cheapeſt white ſand, 30 pounds of unpurified pearl aſhes, 60 pounds of wood aſhes, well burnt and ſifted, 20 pounds of common ſalt, and 5 pounds of arſenic.

2. *French glaſs*, called alſo *Normandy glaſs*, and formerly *Lorraine glaſs*, becauſe made in thoſe provinces. At preſent it is made wholly in the nine glaſs works; five whereof are in the foreſt of Lyons, four in the county of Eu; the laſt at Beaumont near Rouen. It is of a thinner kind than our crown glaſs; and when laid on a piece of white paper, appears of a dirtyiſh green colour. There are but 25 tables of this to the caſe.

3. *German glaſs* is of two kinds, the *white* and the *green:* the firſt is of a whitiſh colour, but is ſubject to thoſe ſmall curved ſtreaks obſerved in our Newcaſtle glaſs, though free from the ſpots and blemiſhes thereof. The green, beſides its colour, is liable to the ſame ſtreaks as the white; but both of them are ſtraighter and leſs warped than our Newcaſtle glaſs.

4. *Dutch glaſs* is not much unlike our Newcaſtle glaſs either in colour or price. It is frequently much warped like that, and the tables are but ſmall.

5. *Newcaſtle glaſs* is that moſt uſed in England. It is of an aſh colour, and much ſubject to ſpecks, ſtreaks, and other blemiſhes; and beſides is frequently warped. Leybourn ſays, there are 45 tables to the caſe, each containing five ſuperficial feet: ſome ſay there are but 35 tables, and ſix feet in each table.

6. *Phial glaſs* is a kind betwixt the flint glaſs and the common bottle or green glaſs. The beſt kind may be prepared with 120 pounds of white ſand, 50 pounds of unpurified pearl aſhes, 10 pounds of common ſalt, 5 pounds of arſenic, and 5 ounces of magneſia. The compoſition for green or common phial glaſs conſiſts of 120 pounds of the cheapeſt white ſand, 80 pounds of wood aſhes well burnt and ſifted, 20 pounds of pearl aſhes, 15 pounds of common ſalt, and 1 pound of arſenic.

The common bottle or green is formed of ſand of any kind fluxed by the aſhes of burnt wood, or of any parts of vegetables; to which may be added the *ſcoriæ* or clinkers of forges. When the ſofteſt ſand is uſed, 200 pounds of wood aſhes will ſuffice for 100 pounds of ſand, which are to be ground and mixed together. The compoſition with the clinkers conſiſts of 170 pounds of wood aſhes, 100 pounds of ſand, and 50 pounds of clinkers or *ſcoriæ*, which are to be ground and mixed together. If the clinkers cannot be ground, they muſt be broke into ſmall pieces, and mixed with the other matter without any grinding.

III. *Working of Plate or Mirror* GLASS. 1. The materials of which this glaſs is made are much the ſame as thoſe of other works of glaſs, viz. an alkali, Glaſs. ſalt and ſand.

The ſalt, however, ſhould not be that extracted from polverine or the aſhes of the Syrian kali, but that from BARILLA, growing about Alicant in Spain. It is very rare that we can have the barilla pure; the Spaniards in burning the herb make a practice of mixing another herb along with it, which alters its quality; or of adding ſand to it to increaſe the weight, which is eaſily diſcovered if the addition be only made after the boiling of the aſhes, but next to impoſſible if made in the boiling. It is from this adulteration that thoſe threads and other defects in plate glaſs ariſe. To prepare the ſalt, they clean it well of all foreign matters; pound or grind it with a kind of mill, and finally ſift it pretty fine.

Pearl aſhes, properly purified, will furniſh the alkali ſalt requiſite for this purpoſe; but it will be neceſſary to add borax or common ſalt, in order to facilitate the fuſion, and prevent the glaſs from ſtiffening in that degree of heat in which it is to be wrought into plates. For purifying the pearl aſhes, diſſolve them in four times their weight of boiling water, in a pot of caſt iron, always kept clean from ruſt. Let the ſolution be removed into a clean tub, and remain there 24 hours or longer. Having decanted the clear part of the fluid from the dregs or ſediment, put it again in the iron pot, and evaporate the water till the ſalts are left perfectly dry. Preſerve them in ſtone jars, well ſecured from air and moiſture.

Pearl aſhes may alſo be purified in the higheſt degree, ſo as to be proper for the manufacture of the moſt tranſparent glaſs, by pulverizing three pounds of the beſt pearl aſhes with ſix ounces of ſaltpetre in a glaſs or marble mortar, till they are well mixed; and then putting part of the mixture into a large crucible, and expoſing it in a furnace to a ſtrong heat. When this is red hot, throw in the reſt gradually; and when the whole is red hot, pour it out on a moiſtened ſtone or marble, and put it into an earthen or clean iron pot, with ten pints of water; heat it over the fire till the ſalts be entirely melted; let it then ſtand to cool, and filter it through paper in a pewter cullender. When it is filtered, put the fluid again into the pot, and evaporate the ſalt to dryneſs, which will then be as white as ſnow; the nitre having burnt all the phlogiſtic matter that remained in the pearl aſhes after their former calcination.

As to the ſand, it is to be ſifted and waſhed till ſuch time as the water come off very clear; and when it is well dried again, they mix it with the ſalt, paſſing the mixture through another ſieve. This done, they lay them in the annealing furnace for about two hours; in which time the matter becomes very light and white: in this ſtate they are called *frit* or *fritta;* and are to be laid up in a dry clean place, to give them time to incorporate: they lie here for at leaſt a year.

When they would employ this frit, they lay it for ſome hours in the furnace, adding to ſome the fragments or ſhards of old and ill made glaſſes; taking care firſt to calcine the ſhards by heating them red hot in the furnace, and thus caſting them into cold water. To the mixture muſt likewiſe be added

Glaſs. ed manganeſe, to promote the fuſion and purification.

The beſt compoſition for looking glaſs plates conſiſts of 60 pounds of white ſand cleanſed, 25 pounds of purified pearl aſhes, 15 pounds of ſaltpetre, and 7 pounds of borax. If a yellow tinge ſhould affect the glaſs, a ſmall proportion of magneſia, mixed with an equal quantity of arſenic, ſhould be added. An ounce of the magneſia may be firſt tried; and if this proves inſufficient, the quantity ſhould be increaſed.

A cheaper compoſition for looking glaſs plate conſiſts of 60 pounds of the white ſand, 20 pounds of pearl aſhes, 10 pounds of common ſalt, 7 pounds of nitre, 2 pounds of arſenic, and 1 pound of borax. The matter of which the glaſſes are made at the famous manufacture of St Gobin in France, is a compoſition of ſolder and of a very white ſand, which are carefully cleaned of all heterogeneous bodies; afterwards waſhed for ſeveral times, and dried ſo as to be pulverized in a mill, conſiſting of many peſtles, which are moved by horſes. When this is done, the ſand is ſifted through ſilk ſieves and dried.

The matter thus far prepared is equally fit for plate glaſs, to be formed either for blowing or by caſting.

The largeſt glaſſes at St Gobin are run; the middle ſized and ſmall ones are blown.

2. *Blowing the plates.* The workhouſes, furnaces, &c. uſed in the making of this kind of plate glaſs, are the ſame, except that they are ſmaller, and that the carquaiſſes are diſpoſed in a large covered gallery, over againſt the furnace, as thoſe in the following article, to which the reader is referred.

After the materials are vitrified by the heat of the fire, and the glaſs is ſufficiently refined, the workman dips in his blowing iron, ſix feet long, and two inches in diameter, ſharpened at the end which is put in the mouth, and widened at the other, that the matter may adhere to it. By this means he takes up a ſmall ball of matter, which ſticks to the end of the tube by conſtantly turning it. He then blows into the tube, that the air may ſwell the annexed ball; and carrying it over a bucket of water, which is placed on a ſupport at the height of about four feet, he ſprinkles the end of the tube to which the matter adheres, with water, ſtill turning it, that by this cooling the matter may coaleſce with the tube, and be fit for ſuſtaining a greater weight. He dips the tube again into the ſame pot, and proceeds as before; and dipping it into the pot a third time, he takes it out, loaded with matter, in the ſhape of a pear, about ten inches in diameter, and a foot long, and cools it at the bucket; at the ſame time blowing into the tube, and with the aſſiſtance of a labourer, giving it a balancing motion, he cauſes the matter to lengthen; which, by repeating this operation ſeveral times, aſſumes the form of a cylinder, terminating like a ball at the bottom, and in a point at the top. The aſſiſtant is then placed on a ſtool three feet and a half high; and on this ſtool there are two upright pieces of timber, with a croſs beam of the ſame, for ſupporting the glaſs and tube, which are kept in an oblique poſition by the aſſiſtant, that the maſter workman may with a puncheon ſet in a wooden handle, and with a mallet, make a hole in the maſs: this hole is drilled at the centre of the ball that terminates the cylinder, and is about an inch in diameter. When the glaſs is pierced, the defects of it are perceived; if it is tolerably perfect, the workman lays the tube horizontally on a little iron treſſel, placed on the ſupport of the aperture of the furnace. Having expoſed it to the heat for about half a quarter of an hour, he takes it away, and with a pair of long and broad ſhears, extremely ſharp at the end, widens the glaſs, by inſinuating the ſhears into the hole made with the puncheon, whilſt the aſſiſtant, mounted on the ſtool, turns it round, till at laſt the opening is ſo large as to make a perfect cylinder at bottom. When this is done, the workman lays his glaſs upon the treſſels at the mouth of the furnace to heat it: he then gives it to his aſſiſtant on the ſtool, and with large ſhears cuts the maſs of matter up to half its height. There is at the mouth of the furnace an iron tool called *pontil*, which is now heating, that it may unite and coaleſce with the glaſs juſt cut, and perform the office which the tube did before it was ſeparated from the glaſs. This pontil is a piece of iron ſix feet long, and in the form of a cane or tube, having at the end of it a ſmall iron bar, a foot long, laid equally upon the long one, and making with it a T. This little bar is full of the matter of the glaſs, about four inches thick. This red hot pontil is preſented to the diameter of the glaſs, which coaleſces immediately with the matter round the pontil, ſo as to ſupport the glaſs for the following operation. When this is done, they ſeparate the tube from the glaſs, by ſtriking a few blows with a chiſſel upon the end of the tube which has been cooled; ſo that the glaſs breaks directly, and makes this ſeparation, the tube being diſcharged of the glaſs now adhering to the pontil. They next preſent to the furnace the pontil of the glaſs, laying it on the treſſel to heat, and redden the end of the glaſs, that the workman may open it with his ſhears, as he has already opened one end of it, to complete the cylinder; the aſſiſtant holding it on his ſtool as before. For the laſt time, they put the pontil on the treſſel, that the glaſs may become red hot, and the workman cuts it quite open with his ſhears, right over againſt the forementioned cut; this he does as before, taking care that both cuts are in the ſame line. In the mean time, the man who looks after the carquaiſſes comes to receive the glaſs upon an iron ſhovel two feet and a half long without the handle, and two feet wide, with a ſmall border of an inch and a half to the right and left, and towards the handle of the ſhovel. Upon this the glaſs is laid, flattening it a little with a ſmall ſtick a foot and a half long, ſo that the cut of the glaſs is turned upwards. They ſeparate the glaſs from the pontil, by ſtriking a few gentle blows between the two with a chiſſel. The glaſs is then removed to the mouth of the hot carquaiſſe, where it becomes red hot gradually; the workman, with an iron tool ſix feet long, and widened at the end in form of a club at cards four inches long, and two inches wide on each ſide, very flat, and not half an inch thick, gradually lifts up the cut part of the glaſs to unfold it out of its form of a flattened cylinder, and render it ſmooth, by turning it down upon the hearth of the carquaiſſe. The tool already deſcribed being inſinuated within the cylinder, performs this operation by being puſhed hard againſt all the parts of the glaſs. When the glaſs is thus made quite ſmooth, it is puſhed to the bottom of the Glaſs.

Glaſs. carquaiſſe or annealing furnace with a ſmall iron raker, and ranged there with a little iron hook. When the carquaiſſe is full, it is ſtopped and cemented as in the caſe of run glaſſes, and the glaſs remains there for a fortnight to be annealed; after which time they are taken out to be poliſhed. A workman can make but one glaſs in an hour, and he works and reſts for ſix hours alternately.

Such was the method formerly made uſe of for blowing plate glaſs, looking glaſſes, &c.; but the workmen, by this method, could never exceed 50 inches in length, and a proportional breadth, becauſe what were larger were always found to warp, which prevented them from reflecting the objects regularly, and wanted ſubſtance to bear the neceſſary grinding. Theſe imperfections have been remedied by the following invention of the Sieur Abraham Thevart, in France, about the year 1688.

3. *Caſting or Running of Large Mirror* GLASS *Plates.* The furnace is of a very large dimenſion, environed with ſeveral ovens, or annealing furnaces, called *carquaiſſes*, beſides others for making of frit and calcining old pieces of glaſs. This furnace, before it is fit to run glaſs, coſts 3500l. It ſeldom laſts above three years, and even in that time it muſt be refitted every ſix months. It takes ſix months to rebuild it, and three months to refit it. The melting pots are as big as large hogſheads, and contain about 2000 weight of metal. If one of them burſts in the furnace, the loſs of the matter and time amounts to 250l. The materials in theſe pots are the ſame as deſcribed before. When the furnace is red hot, theſe materials are put in at three different times, becauſe that helps the fuſion; and in 24 hours they are vitrified, refined, ſettled, and fit for caſting. A is the bocca, or mouth of the furnace; B is the ciſtern that conveys the liquid glaſs it receives out of the melting pots in the furnace to the caſting table. Theſe ciſterns are filled in the furnace, and remain therein ſix hours after they are filled; and then are hooked out by the means of a large iron chain, guided by a pulley, placed upon a carriage with four wheels marked C, by two men. This carriage has no middle piece; ſo that when it has brought the ciſtern to the caſting table D, they ſlip off the bottom of the ciſtern, and out ruſhes a torrent of flaming matter upon the table: this matter is confined to certain dimenſions by the iron rulers EE, which are moveable, retain the fluid matter, and determine the width of the glaſs; while a man, with the roller F reſting on the edge of the iron rulers, reduceth it as it cools to an equal thickneſs, which is done in the ſpace of a minute. This table is ſupported on a wooden frame, with truſtles for the convenience of moving to the annealing furnace; into which, ſtrewed with ſand, the new plate is ſhoved, where it will harden in about 10 days.

Plate CCXLVII. fig. 2.

What is moſt ſurpriſing throughout the whole of this operation, is the quickneſs and addreſs wherewith ſuch maſſy ciſterns, filled with a flaming matter, are taken out of the furnace, conveyed to the table, and poured therein, the glaſs ſpread, &c. The whole is inconceivable to ſuch as have not been eye witneſſes of that ſurpriſing manufacture.

As faſt as the ciſterns are emptied, they carry them back to the furnace and take freſh ones, which they empty as before. Thus they continue to do ſo long as there are any full ciſterns; laying as many plates in each carquaiſſe as it will hold, and ſtopping them up with doors of baked earth, and every chink with cement, as ſoon as they are full, to let them anneal, and cool again, which requires about 14 days. Glaſs.

The firſt running being diſpatched, they prepare another, by filling the ciſterns anew from the matter in the pots; and after the ſecond, a third; and even a fourth time, till the melting pots are quite empty.

The ciſterns at each running ſhould remain at leaſt ſix hours in the furnace to whiten; and when the firſt annealing furnace is full, the caſting table is to be carried to another. It need not here be obſerved, that the carquaiſſes, or annealing furnaces, muſt firſt have been heated to the degree proper for them. It may be obſerved, that the oven full, or the quantity of matter commonly prepared, ſupplies the running of 18 glaſſes, which is performed in 18 hours, being an hour for each glaſs. The workmen work ſix hours, and are then relieved by others.

When the pots are emptied, they take them out, as well as the ciſterns, to ſcrape off what glaſs remains, which otherwiſe would grow green by continuance of fire, and ſpoil the glaſſes. They are not filled again in leſs than 36 hours; ſo that they put the matter into the furnace, and begin to run it every 54 hours.

The manner of heating the large furnaces is very ſingular; the two tiſors, or perſons employed for that purpoſe, in their ſhirts, run ſwiftly round the furnace without making the leaſt ſtop: as they run along, they take two billets, or pieces of wood, which are cut for the purpoſe: theſe they throw into the firſt tiſſart; and continuing their courſe, do the ſame for the ſecond. This they hold without interruption for ſix hours ſucceſſively; after which they are relieved by others, &c. It is ſurpriſing that two ſuch ſmall pieces of wood, and which are conſumed in an inſtant, ſhould keep the furnace to the proper degree of heat; which is ſuch, that a large bar of iron, laid at one of the mouths of the furnace, becomes red hot in leſs than half a minute.

The glaſs, when taken out of the melting furnace, needs nothing farther but to be ground, poliſhed, and foliated.

4. *Grinding and Poliſhing of Plate* GLASS. Glaſs is made tranſparent by fire; but it receives its luſtre by the ſkill and labour of the grinder and poliſher; the former of whom takes it rough out of the hands of the maker.

In order to grind plate glaſs, they lay it horizontally upon a flat ſtone table made of a very fine grained freeſtone; and for its greater ſecurity they plaſter it down with lime or ſtucco; for otherwiſe the force of the workmen, or the motion of the wheel with which they grind it, would move it about.

This ſtone table is ſupported by a ſtrong frame A, made of wood, with a ledge quite round its edges, riſing about two inches higher than the glaſs. Upon this glaſs to be ground is laid another rough glaſs not above half ſo big, and ſo looſe as to ſlide upon it; but cemented to a wooden plank, to guard it from the injury it muſt otherwiſe receive from the ſcraping of the wheel to which this plank is faſtened, and from the weights laid upon it to promote the grinding or triture of the glaſſes. The whole is covered with a wheel B, made

Plate CCXLVII. fig. 3.

FURNACE FOR ARTIFICIAL GEMS.

Fig 1 BLOWING.

FURNACE FOR ARTIFICIAL GEMS.

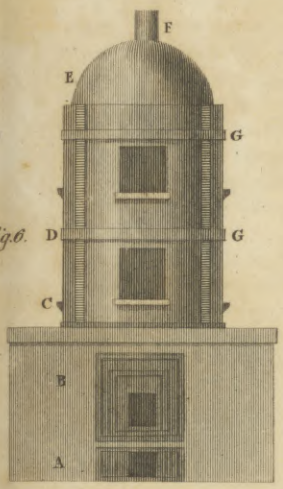
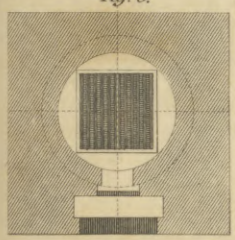
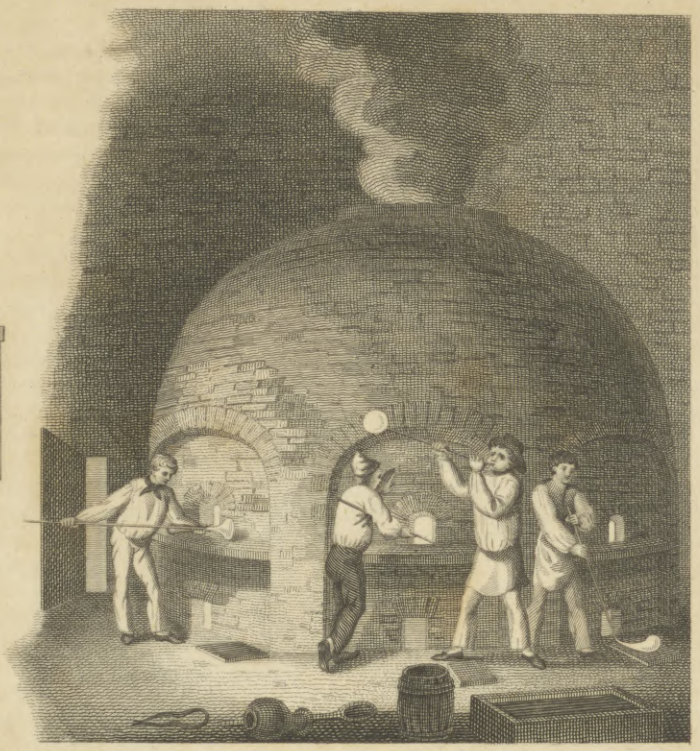


Fig.6.

Fig. 5.





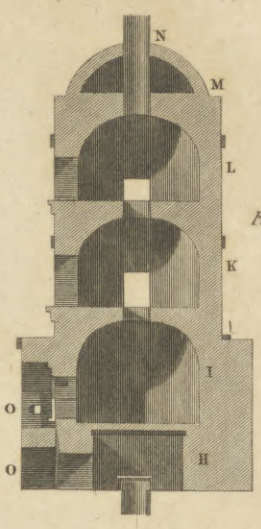


Fig. 7.

Fig.4.

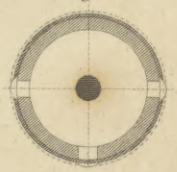
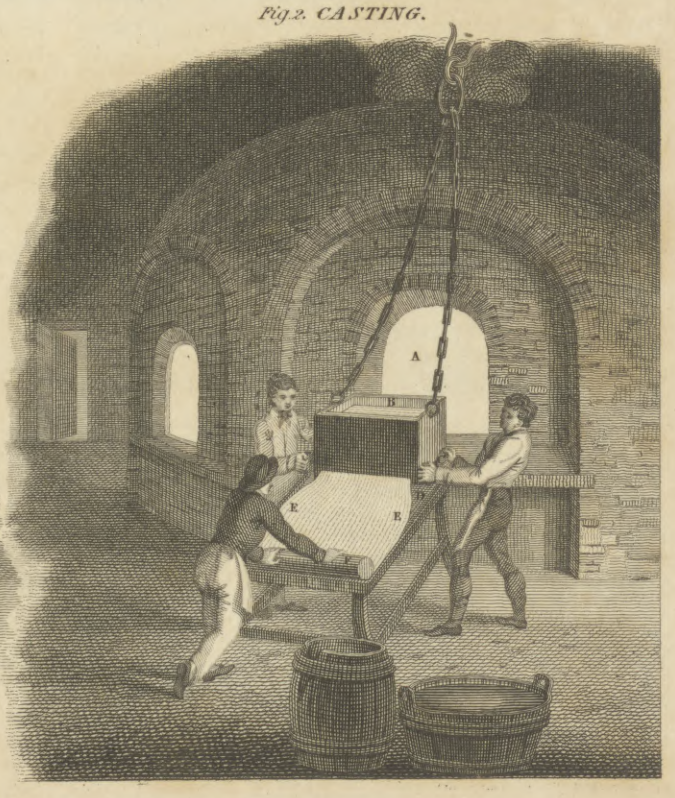


Fig.3. POLISHING.

Fig.2. CASTING.



Drawn & Engraved by

Wm. D. Lizars Edinburgh.

Glaſs. made of hard light wood, about ſix inches in diameter, by pulling of which backwards and forwards alternately, and ſometimes turning it round, the workmen, who always ſtand oppoſite to each other, produce a conſtant attrition between the two glaſſes, and bring them to what degree of ſmoothneſs they pleaſe, by firſt pouring in water and coarſe ſand; after that, a finer ſort of ſand, as the work advanceth, till at laſt they muſt pour in the powder of ſmalt. As the upper or incumbent glaſs poliſhes and grows ſmoother, it muſt be taken away, and another from time to time put in its place.

This engine is called a *mill* by the artiſts, and is uſed only in the largeſt ſized glaſſes; for in the grinding of the leſſer glaſſes, they are content to work without a wheel, and to have only four wooden handles faſtened to the four corners of the ſtone which loads the upper plank, by which they work it about.

When the grinder has done his part, who finds it very difficult to bring the glaſs to an exact plainneſs, it is turned over to the poliſher; who, with the fine powder of tripoli ſtone or emery, brings it to a perfect evenneſs and luſtre. The inſtrument made uſe of in this branch is a board, *c c*, furniſhed with a felt, and a ſmall roller, which the workman moves by means of a double handle at both ends. The artiſt, in working this roller, is aſſiſted with a wooden hoop or ſpring, to the end of which it is fixed: for the ſpring, by conſtantly bringing the roller back to the ſame points, facilitates the action of the workman's arm.

Colouring of GLASS. That the colours given to glaſs may have their full beauty, it muſt be obſerved, that every pot when new, and firſt uſed, leaves a foulneſs in the glaſs from its own earthy parts; ſo that a coloured glaſs made in a new pot can never be bright or perfectly fine. For this reaſon, the larger of theſe, when new, may be glazed with white glaſs; but the ſecond time of uſing the pots loſe this foulneſs. The glazing may be done by reducing the glaſs to powder, and moiſtening the inſide of the pot with water; while it is yet moiſt, put in ſome of the powdered glaſs, and ſhake it about, till the whole inner ſurface of the pot be covered by as much as will adhere to it, in conſequence of the moiſture. Throw out the redundant part of the powdered glaſs; and the pot being dry, ſet it in a furnace ſufficiently hot to vitrify the glaſs adhering to it, and let it continue there ſome time; after which, care muſt be taken to let it cool gradually. Thoſe pots which have ſerved for one colour muſt not be uſed for another; for the remainder of the old matter will ſpoil the colour of the new. The colours muſt be very carefully calcined to a proper degree; for if they are calcined either too much or too little, they never do well; the proper proportion, as to quantity, muſt alſo carefully be regarded, and the furnaces muſt be fed with dry hard wood. And all the proceſſes ſucceed much the better if the colour be uſed dividedly, that is, a part of it in the frit, and the reſt in the melted metal.

A hard glaſs, proper for receiving colours, may be prepared by pulverizing 12 pounds of the beſt ſand, cleanſed by waſhing in a glaſs or flint mortar, and mixing ſeven pounds of pearl aſhes or any fixed alkaline ſalt purified with nitre, one pound of ſaltpetre, and half a pound of borax, and pounding them together. A glaſs leſs hard may be prepared of twelve pounds of white ſand cleanſed, ſeven pounds of pearl aſhes purified with ſaltpetre, one pound of nitre, half a pound of borax, and four ounces of arſenic prepared as before. Glaſs.

Amethyſt colour. See *Purple* below, and the article AMETHYST.

Balas colour. Put into a pot cryſtal frit, thrice waſhed in water; tinge this with manganeſe, prepared into a clear purple; to this add *alumen cativum*, ſifted fine, in ſmall quantities, and at ſeveral times: this will make the glaſs grow yellowiſh, and a little reddiſh, but not blackiſh, and always diſſipates the manganeſe. The laſt time you add manganeſe give no more of the *alumen cativum*, unleſs the colour be too full. Thus will the glaſs be exactly of the colour of the balas ruby. See *Ruby GLASS*.

The common black colour. The glaſsmakers take old broken glaſs of different colours, grind it to powder, and add to it, by different parcels, a ſufficient quantity of a mixture of two parts zaffer and one part manganeſe: when well purified, they work it into veſſels, &c.

Glaſs beads are coloured with manganeſe only.

Black velvet colour. To give this deep and fine colour to glaſs, take of cryſtalline and pulverine frit, of each 20 pounds; of calx of lead and tin, four pounds; ſet all together in a pot in the furnace, well heated; when the glaſs is formed and pure, take ſteel well calcined and powdered, ſcales of iron that fly off from the ſmith's anvil, of each an equal quantity; powder and mix them well; then put ſix ounces of this powder to the above-deſcribed metal while in fuſion: mix the whole thoroughly together, and let them all boil ſtrongly together; then let it ſtand in fuſion 12 hours to purify, and after this work it. It will be a moſt elegant velvet black.

There is another way of doing this, which alſo produces a very fair black. It is this: take a hundred weight of rochetta frit, add to this two pounds of tartar and ſix pounds of manganeſe, both in fine powder; mix them well; and put them to the metal while in fuſion, at different times, in ſeveral parcels; let it ſtand in fuſion after this for four days, and then work it.

A glaſs perfectly black may alſo be formed by adding to ten pounds of either of the compoſitions for hard glaſs above deſcribed, one ounce of zaffer, ſix drachms of manganeſe, and an equal quantity of iron ſtrongly calcined.

Blue colour. A full blue may be made by adding ſix drachms of zaffer and two drachms of manganeſe to ten pounds of either of the compoſitions for hard glaſs, deſcribed above. For a very cool or pure blue glaſs, half an ounce of calcined copper may be uſed inſtead of the manganeſe, and the proportion of zaffer diminiſhed by one half. Glaſs reſembling ſapphire may be made with ten pounds of either of the compoſitions for hard glaſs, three drachms and one ſcruple of zaffer, and one drachm of the *calx caſſii* or precipitation of gold by tin; or, inſtead of this latter ingredient, two drachms and two ſcruples of manganeſe. Or a ſapphire-coloured glaſs may be made by mixing with any quantity of the hard glaſs one-eighth of its weight of ſmalt. A beautiful blue glaſs is alſo produced from the oxide of cobalt.

Venetian brown, with gold ſpangles, commonly called

Glaſs. the *philoſopher's ſtone*, may be prepared in the following manner: take of the ſecond compoſition for hard glaſs above deſcribed, and of the compoſition for paſte, of each five pounds, and of highly calcined iron an ounce; mix them well, and fuſe them till the iron be perfectly vitrified, and has tinged the glaſs of a deep tranſparent yellow brown colour. Powder this glaſs, and add to it two pounds of powdered glaſs of antimony; grind them together, and thus mix them well. Take part of this mixture, and rub into it 80 or 100 leaves of the counterfeit leaf gold called *Dutch gold;* and when the parts of the gold ſeem ſufficiently divided, mix the powder containing it with the other part of the glaſs. Fuſe the whole with a moderate heat till the powder run into a vitreous maſs, fit to be wrought into any of the figures or veſſels into which it is uſually formed; but avoid a perfect liquefaction, becauſe that in a ſhort time deſtroys the equal diffuſion of the ſpangles, and vitrifies, at leaſt in part, the matter of which they are compoſed; converting the whole into a kind of tranſparent olive-coloured glaſs. This kind of glaſs is uſed for a great variety of toys and ornaments with us, who at preſent procure it from the Venetians.

Chalcedony. A mixture of ſeveral ingredients with the common matter of glaſs, will make it repreſent the ſemi-opake gems, the jaſpers, agates, chalcedonies, &c. The way of making theſe ſeems to be the ſame with the method of making marbled paper, by ſeveral colours diſſolved in ſeveral liquors, which are ſuch as will not readily mix with one another when put into water, before they are caſt upon the paper which is to be coloured. There are ſeveral ways of making theſe variouſly coloured glaſſes, but the beſt is the following.

Diſſolve four ounces of fine leaf ſilver in a glaſs veſſel in ſtrong aquafortis; ſtop up the veſſel, and ſet it aſide.—In another veſſel, diſſolve five ounces of quick-ſilver in a pound of aquafortis, and ſet this aſide.—In another glaſs veſſel, diſſolve in a pound of aquafortis three ounces of fine ſilver, firſt calcined in this manner: amalgamate the ſilver with mercury, mix the amalgam with twice its weight of common ſalt well purified; put the mixture in an open fire in a crucible, that the mercury may fly off, and the ſilver be left in form of powder. Mix this powder with an equal quantity of common ſalt well purified, and calcine this for ſix hours in a ſtrong fire; when cold, waſh off the ſalt by repeated boilings in common water, and then put the ſilver into the aquafortis. Set this ſolution alſo aſide.—In another veſſel, diſſolve in a pound of aquafortis three ounces of ſal ammoniac; pour off the ſolution and diſſolve in it a quarter of an ounce of gold. Set this alſo aſide.—In another veſſel, diſſolve three ounces of ſal ammoniac in a pound of aquafortis; then put into the ſolution cinnabar, crocus martis, ultramarine, and ferretto of Spain, of each half an ounce. Set this alſo aſide.—In another veſſel, diſſolve in a pound of aquafortis three ounces of ſal ammoniac; then put into it crocus martis made with vinegar, calcined tin, zaffer, and cinnabar, of each half an ounce; let each of theſe be powdered very fine, and put gently into the aquafortis. Set this alſo aſide.—In another veſſel, diſſolve three ounces of ſal ammoniac in a pound of aquafortis, and add to it braſs calcined with brimſtone, braſs thrice calcined, manganeſe, and ſcales of iron which fall from the ſmith's anvil, of each half an ounce; let each be well powdered, and put gently into the veſſel. Then ſet this alſo aſide.—In another veſſel, diſſolve two ounces of ſal ammoniac in a pound of aquafortis, and put to it verdigriſe an ounce, red lead, crude antimony, and the caput mortuum of vitriol, of each half an ounce; put theſe well powdered leiſurely into the veſſel, and ſet this alſo aſide.—In another veſſel, diſſolve two ounces of ſal ammoniac in a pound of aquafortis, and add orpiment, white arſenic, painters lake, of each half an ounce. Glaſs.

Keep the above nine veſſels in a moderate heat for 15 days, ſhaking them well at times. After this pour all the matters from theſe veſſels into one large veſſel, well luted at its bottom; let this ſtand ſix days, ſhaking it at times; and then ſet it in a very gentle heat, and evaporate all the liquor, and there will remain a powder of a purpliſh green.

When this is to be wrought, put into a pot very clear metal, made of broken cryſtalline and white glaſs that has been uſed; for with the virgin frit, or ſuch as has never been wrought, the chalcedony can never be made, as the colours do not ſtick to it, but are conſumed by the frit. To every pot of 20 pounds of this metal put two or three ounces of this powder at three ſeveral times; incorporate the powder well with the glaſs; and let it remain an hour between each time of putting in the powders. After all are in, let it ſtand 24 hours; then let the glaſs be well mixed, and take an aſſay of it, which will be found of a yellowiſh blue; return this many times into the furnace; when it begins to grow cold, it will ſhow many waves of different colours very beautifully. Then take tartar eight ounces, ſoot of the chimney two ounces, crocus martis made with brimſtone, half an ounce; let theſe be well powdered and mixed, and put them by degrees into the glaſs at ſix times, waiting a little while between each putting in. When the whole is put in, let the glaſs boil and ſettle for 24 hours; then make a little glaſs body of it; which put in the furnace many times, and ſee if the glaſs be enough, and whether it have on the outſide veins of blue, green, red, yellow, and other colours, and have, beſide theſe veins, waves like thoſe of the chalcedonies, jaſpers, and oriental agates, and if the body kept within looks as red as fire.

When it is found to anſwer this, it is perfect, and may be worked into toys and veſſels, which will always be beautifully variegated; theſe muſt be well annealed, which adds much to the beauty of their veins. Maſſes of this may be poliſhed at the lapidary's wheel as natural ſtones, and appear very beautiful. If in the working the matter grow tranſparent, the work muſt be ſtopped, and more tartar, ſoot, and crocus martis, muſt be put to it, which will give it again the neceſſary body and opacity, without which it does not ſhow the colours well.

Chryſolite colour may be made of ten pounds of either of the compoſitions for hard glaſs deſcribed above, and ſix drachms of calcined iron.

Red cornelian colour may be formed by adding one pound of glaſs of antimony, two ounces of the calcined vitriol called *ſcarlet ochre*, and one drachm of manganeſe or magneſia, to two pounds of either of the compoſitions

Glaſs. poſitions for hard glaſs. The glaſs of antimony and magneſia are firſt fuſed with the other glaſs, and then powdered and ground with the ſcarlet ochre: the whole mixture is afterwards fuſed with a gentle heat till all the ingredients are incorporated. A glaſs reſembling the white cornelian may be made of two pounds of either of the compoſitions for hard glaſs, and two drachms of yellow ochre well waſhed, and one ounce of calcined bones: grind them together, and fuſe them with a gentle heat.

Emerald colour. See *Green* below.

Garnet colour. To give this colour to glaſs, the workmen take the following method. They take equal quantities of cryſtal and rochetta frit, and to every hundred weight of this mixture they add a pound of manganeſe and an ounce of prepared zaffer: theſe are to be powdered ſeparately, then mixed and added by degrees to the frit while in the furnace. Great care is to be taken to mix the manganeſe and zaffer very perfectly; and when the matter has ſtood 24 hours in fuſion, it may be worked.

Glaſs of this kind may be made by adding one pound of glaſs of antimony, one drachm of manganeſe, and the ſame quantity of the precipitate of gold by tin, to two pounds of either of the compoſitions for hard glaſs; or the precipitate of gold may be omitted, if the quantities of the glaſs of antimony and manganeſe be doubled.

Gold colour. This colour may be produced by taking ten pounds of either of the compoſitions for hard glaſs, omitting the ſaltpetre; and for every pound adding an ounce of calcined borax, or, if this quantity doth not render the glaſs ſufficiently fuſible, two ounces; ten ounces of red tartar of the deepeſt colour; two ounces of magneſia; and two drachms of charcoal of ſallow, or any other ſoft kind. Precipitates of ſilver baked on glaſs will ſtain it yellow, and likewiſe give a yellow colour on being mixed and melted with 40 or 50 times their weight of vitreous compoſitions; the precipitate from aquafortis by fixed alkali ſeems to anſwer beſt. Yellow glaſſes may alſo be obtained with certain preparations of iron, particularly with Pruſſian blue. But Dr Lewis obſerves, that the colour does not conſtantly ſucceed, nor approach to the high colour of gold, with ſilver or with iron. The neareſt imitations of gold which he has been able to produce have been effected with antimony and lead. Equal parts of the glaſs of antimony, of flint calcined and powdered, and of minium, formed a glaſs of a high yellow; and with two parts of glaſs of antimony, two of minium, and three of powdered flint, the colour approached ſtill more to that of gold. The laſt compoſition exhibited a multitude of ſmall ſparkles interſperſed throughout its whole ſubſtance, which gave it a beautiful appearance in the maſs, but were really imperfections, owing to air bubbles.

Neri directs, for a gold yellow colour, one part of red tartar and the ſame quantity of manganeſe, to be mixed with a hundred parts of frit. But Kunckel obſerves, that theſe proportions are faulty; that one part, or one and a quarter, of manganeſe, is ſufficient for a hundred of frit; but that ſix parts of tartar are hardly enough, unleſs the tartar is of a dark red colour, almoſt blackiſh; and that he found it expedient to add to the tartar about a fourth of its weight of powdered charcoal. He adds, that the glaſs ſwells up very much in melting, and that it muſt be left unſtirred, and worked as it ſtands in fuſion. Mr Samuel More, in repeating and varying this proceſs in order to render the colour more perfect, found that the manganeſe is entirely uneſſential to the gold colour; and that the tartar is no otherwiſe of uſe than in virtue of the coaly matter to which it is in part reduced by the fire, the phlogiſton or inflammable part of the coal appearing in ſeveral experiments to be the direct tinging ſubſtance. Mr Pott alſo obſerves, that common coals give a yellow colour to glaſs; that different coaly matters differ in their tinging power; that caput mortuum of ſoot and lamp black anſwer better than common charcoal; and that the ſparkling coal, which remains in the retort after the rectification of the thick empyreumatic animal oils, is one of the moſt active of theſe preparations. This preparation, he ſays, powdered, and then burnt again a little in a cloſe veſſel, is excellent for tinging glaſs, and gives yellow, brown, reddiſh, or blackiſh colours, according to its quantity; but the frit muſt not be very hard of fuſion, for in this caſe the ſtrong fire will deſtroy the colouring ſubſtance before the glaſs melts: and he has found the following compoſition to be nearly the beſt; viz. ſand two parts, alkali three parts; or ſand two, alkali three, calcined borax one; or ſand two, alkali two, calcined borax one: and though ſaltpetre is hardly uſed at all, or very ſparingly, for yellow glaſſes, as it too much volatilizes the colouring ſubſtance; yet here for the moſt part a certain proportion of it, eaſily determined by trial, is very neceſſary; for without it the concentrated colouring matter is apt to make the glaſs too dark, and even of an opake pitchy blackneſs. It does not certainly appear that there is any material diverſity in the effects of different coals, the difference being probably owing to the different quantities of the inflammable matter which they contain; ſo that a little more ſhall be required of one kind than of another for producing the ſame degree of colour in the glaſs. Nor does the ſoftneſs or fuſibility of the frit appear to be in any reſpect neceſſary.

Gold-coloured ſpangles may be diffuſed through the ſubſtance of glaſs, by mixing the yellow talcs with powdered glaſs, and bringing the mixture into fuſion.

Green. This colour may be imparted to glaſs by adding three ounces of copper precipitated from aquafortis, and two drachms of precipitated iron, to nine pounds of either of the compoſitions for hard glaſs. The fineſt method of giving this beautiful colour to glaſs is this: Take five pounds of cryſtalline metal that has been paſſed ſeveral times through water, and the ſame quantity of the common white metal of polverine, four pounds of common polverine frit, and three pounds of red lead; mix the red lead well with the frit, and then put all into a pot in a furnace. In a few hours the whole maſs will be well purified: then caſt the whole into water, and ſeparate and take out the lead; then return the metal into the pot, and let it ſtand a day longer in fuſion; then put in the powder of the reſiduum of the vitriol of copper, and a very little crocus martis, there will be produced a moſt lively and elegant green, ſcarce inferior to that of the oriental emerald. There are many ways of giving a green to glaſs, but all are greatly inferior to this.—To make a *ſea green*, the fineſt cryſtalline glaſs only muſt be uſed, and no manganeſe muſt.

Glaſs. muſt be added at firſt to the metal. The cryſtal frit muſt be melted thus alone; and the ſalt, which ſwims like oil on its top, muſt be taken off with an iron ladle very carefully. Then to a pot of twenty pounds of this metal add ſix ounces of calcined braſs, and a fourth part of the quantity of powdered zaffer: this powder muſt be well mixed, and put into the glaſs at three times; it will make the metal ſwell at firſt, and all muſt be thoroughly mixed in the pot. After it has ſtood in fuſion three hours, take out a little for a proof: if it be too pale, add more of the powder. Twenty-four hours after the mixing the powder the whole will be ready to work; but muſt be well ſtirred together from the bottom, leſt the colour ſhould be deepeſt there, and the metal at the top leſs coloured, or even quite colourleſs. Some uſe for this purpoſe half cryſtal frit and half rochetta frit, but the colour is much the fineſt when all cryſtal frit is uſed.

Lapis lazuli colour. See *Lapis* LAZULI.

Opal colour. See OPAL.

Purple of a deep and bright colour may be produced by adding to ten pounds of either of the compoſitions for hard glaſs, above deſcribed, ſix drachms of zaffer and one drachm of gold precipitated by tin; or to the ſame quantity of either compoſition one ounce of manganeſe and half an ounce of zaffer. The colour of amethyſt may be imitated in this way.

Red. A blood-red glaſs may be made in the following manner: Put ſix pounds of glaſs of lead, and ten pounds of common glaſs, into a pot glazed with white glaſs. When the whole is boiled and refined, add by ſmall quantities, and at ſmall diſtances of time, copper calcined to a redneſs as much as on repeated proofs is found ſufficient: then add tartar in powder by ſmall quantities at a time, till the glaſs is become as red as blood; and continue adding one or other of the ingredients till the colour is quite perfect.

Ruby. The way to give the true fine red of the ruby, with a fair tranſparence, to glaſs, is as follows: Calcine in earthen veſſels gold diſſolved in aqua-regia; the menſtruum being evaporated by diſtillation, more aqua-regia added, and the abſtraction repeated five or ſix times, till it becomes a red powder. This operation will require many days in a hot furnace. When the powder is of a proper colour, take it out: and when it is to be uſed, melt the fineſt cryſtal glaſs, and purify it by often caſting it into water; and then add, by ſmall quantities, enough of this red powder to give it the true colour of a ruby, with an elegant and perfect tranſparence.

The proceſs of tinging glaſs and enamels by preparations of gold was firſt attempted about the beginning of the laſt century. Libavius, in one of his tracts entitled *Alchymia*, printed in 1606, conjectures that the colour of the ruby proceeds from gold, and that gold diſſolved and brought to redneſs might be made to communicate a like colour to factitious gems and glaſs. On this principle Neri, in his Art of Glaſs, dated in 1611, gives the proceſs above recited. Glauber in 1648 publiſhed a method of producing a red colour by gold, in a matter which is of the vitreous kind, though not perfect glaſs. For this purpoſe he ground powdered flint or ſand with four times its weight of fixed alkaline ſalt: this mixture melts in a moderately ſtrong fire, and when cool looks like glaſs, but expoſed to the air runs into a liquid ſtate. On adding this liquor to ſolution of gold in aqua-regia, the gold and flint precipitate together in form of a yellow powder, which by calcination becomes purple. By mixing this powder with three or four times its weight of the alkaline ſolution of flint, drying the mixture, and melting it in a ſtrong fire for an hour, a maſs is obtained of a tranſparent ruby colour and of a vitreous appearance; which nevertheleſs is ſoluble in water, or by the moiſture of the air, on account of the redundance of the ſalt. The Honourable Mr Boyle, in a work publiſhed in 1680, mentions an experiment in which a like colour was introduced into glaſs without fuſion; for having kept a mixture of gold and mercury in digeſtion for ſome months, the fire was at laſt immoderately increaſed, ſo that the glaſs burſt with a violent exploſion; and the lower part of the glaſs was found tinged throughout of a tranſparent red colour, hardly to be equalled by that of rubies. Glaſs.

About the ſame time Caſſius is ſaid to have diſcovered the precipitation of gold by tin, and that glaſs might be tinged of a ruby colour by melting it with this precipitate; though he does not appear, ſays Dr Lewis, from his treatiſe *De Auro*, to have been the diſcoverer of either. He deſcribes the preparation of the precipitate and its uſe; but gives no account of the manner of employing it, only that he ſays one drachm of gold duly prepared will tinge ten pounds of glaſs. *Commerce of Arts*, p. 171. 621. &c.

This proceſs was ſoon after brought to perfection by Kunckel; who ſays, that one part of the precipitate is ſufficient to give a ruby colour to 1280 parts of glaſs, and a ſenſible redneſs to upwards of 1900 parts; but that the ſucceſs is by no means conſtant. Kunckel alſo mentions a purple gold powder, reſembling that of Neri; which he obtained by inſpiſſating ſolution of gold to dryneſs; abſtracting from it freſh aqua-regia three or four times, till the matter appears like oil; then precipitating with ſtrong alkaline ley, and waſhing the precipitate with water. By diſſolving this powder in ſpirit of ſalt and precipitating again, it becomes, he ſays, extremely fair; and in this ſtate he directs it to be mixed with a due proportion of Venice glaſs.

Orſchal, in a treatiſe entitled *Sol ſine Veſte*, gives the following proceſs for producing a very fine ruby. He directs the purple precipitate made by tin to be ground with ſix times its quantity of Venice glaſs into a very fine powder, and this compound to be very carefully mingled with the frit or vitreous compoſition to be tinged. His frit conſiſts of equal parts of borax, nitre, and fixed alkaline ſalt, and four times as much calcined flint as of each of the ſalts; but he gives no directions as to the proportion of the gold precipitate or mode of fuſion. Hellot deſcribes a preparation, which, mixed with Venice glaſs, was found to give a beautiful purple enamel. This preparation conſiſts of equal parts of ſolution of gold and of ſolution of zinc in aqua-regia mixed together, with the addition of a volatile ſalt prepared from ſal ammoniac by quicklime, in ſufficient quantity to precipitate the two metals. The precipitate is then gradually heated till it acquires a violet colour. However, though a purple or red colour, approaching to that of ruby, may, by the methods above recited, be baked on glaſs or enamels, and introduced into the maſs by fuſion, the way of equally diffuſing ſuch

Glaſs. ſuch a colour through a quantity of fluid glaſs is ſtill, ſays Dr Lewis, a ſecret. The following proceſs for making the ruby glaſs was communicated to Dr Lewis by an artiſt, who aſcribed it to Kunekel. The gold is directed to be diſſolved in a mixture of one part of ſpirit of ſalt and three of aquafortis, and the tin in a mixture of one part of the former of theſe acids with two of the latter. The ſolution of gold being properly diluted with water, the ſolution of tin is added, and the mixture left to ſtand till the purple matter has ſettled to the bottom. The colourleſs liquor is then poured off, and the purple ſediment, while moiſt and not very thick, is thoroughly mixed with powdered flint or ſand. This mixture is well ground with powdered nitre, tartar, borax, and arſenic, and the compound melted with a ſuitable fire. The proportions of the ingredients are 2560 parts of ſand, 384 of nitre, 240 of tartar, 240 of borax, 28 of arſenic, five of tin, and five of gold.

Topaz Colour. Glaſs reſembling this ſtone may be made by pulverizing ten pounds of either of the compoſitions for hard glaſſes with an equal quantity of the gold-coloured glaſs, and fuſing them together.

White opake and *ſemitranſparent* glaſs may be made of ten pounds of either of the compoſitions for hard glaſs, and one pound of well calcined horn, ivory, or bone; or an opake whiteneſs may be given to glaſs by adding one pound of very white arſenic to ten pounds of flint glaſs. Let them be well powdered and mixed by grinding them together, and then fuſed with a moderate heat till they are thoroughly incorporated. A glaſs of this kind is made in large quantities at a manufactory near London; and uſed not only for different kinds of veſſels, but as a white ground for enamel in dial plates and ſnuff boxes, which do not require finiſhing with much fire, becauſe it becomes very white and fuſible with a moderate heat.

Yellow. See *Gold colour* above.

Painting in GLASS. The ancient manner of painting in glaſs was very ſimple: it conſiſted in the mere arrangement of pieces of glaſs of different colours in ſome ſort of ſymmetry, and conſtituted what is now called *moſaic work*. See MOSAIC.

In proceſs of time they came to attempt more regular deſigns, and alſo to repreſent figures heightened with all their ſhades: yet they proceeded no farther than the contours of the figures in black with water colours, and hatching the draperies after the ſame manner on glaſſes of the colour of the object they deſigned to paint. For the carnation, they uſed glaſs of a bright red colour; and upon this they drew the principal lineament of the face, &c. with black.

At length, the taſte for this kind of painting improving conſiderably, and the art being found applicable to the adorning of churches, baſilics, &c. they found out means of incorporating the colours in the glaſs itſelf, by heating them in the fire to a proper degree; having firſt laid on the colours. A French painter at Marſeilles is ſaid to have given the firſt notion of this improvement, upon going to Rome under the pontificate of Julius II.; but Albert Durer and Lucas of Leyden were the firſt that carried it to any height.

This art, however, has frequently met with much interruption, and ſometimes been almoſt totally loſt; of which Mr Walpole gives us the following account, in his Anecdotes of Painting in England. Glaſs.

"The firſt interruption given to it was by the reformation, which baniſhed the art out of churches; yet it was in ſome meaſure kept up in the eſcutcheons of the nobility and gentry in the windows of their ſeats. Towards the end of Queen Elizabeth's reign it was omitted even there; yet the practice did not entirely ceaſe. The chapel of our Lady at Warwick was ornamented anew by Robert Dudley earl of Leiceſter, and his counteſs, and the cipher of the glaſs-painter's name yet remains, with the date 1574: and in ſome of the chapels at Oxford the art again appears, dating itſelf in 1622, by the hand of no contemptible maſter.

"I could ſupply even this gap of 48 years by many dates on Flemiſh glaſs; but no body ever ſuppoſed that the ſecret was loſt ſo early as the reign of James I. and that it has not periſhed ſince will be evident from the following ſeries, reaching to the preſent hour.

"The portraits in the windows of the library at All Souls, Oxford. In the chapel at Queen's College there are twelve windows dated 1518. P. C. a cipher on the painted glaſs in the chapel at Warwick, 1574. The windows at Wadham's College; the drawing pretty good, and the colours fine, by Bernard Van Linge, 1622. In the chapel at Lincoln's Inn, a window, with the name Bernard, 1623. This was probably the preceding Van Linge. In the church of St Leonard, Shoreditch, two windows by Baptiſta Sutton, 1634. The windows in the chapel at Univerſity College, Hen. Giles *pinxit*, 1687. At Chriſt Church, Iſaac Oliver, aged 84, 1700. Window in Merton Chapel, William Price 1700. Windows at Queen's New College, and Maunlin, by William Price, the ſon, now living, whoſe colours are fine, whoſe drawing is good, and whoſe taſte in ornaments and moſaic is far ſuperior to any of his predeceſſors; is equal to the antique, to the good Italian maſters, and only ſurpaſſed by his own ſingular modeſty.

"It may not be unwelcome to the curious reader to ſee ſome anecdotes of the revival of taſte for painted glaſs in England. Price, as we have ſaid, was the only painter in that ſtyle for many years in England. Afterwards one Rowell, a plumber at Reading did ſome things, particularly for the late Henry earl of Pembroke; but Rowell's colours ſoon vaniſhed. At laſt he found out a very durable and beautiful red; but he died in a year or two, and the ſecret with him. A man at Birmingham began the ſame art in 1756 or 1757, and fitted up a window for Lord Lyttleton, in the church of Hagley; but ſoon broke. A little after him, one Peckitt at York began the ſame buſineſs, and has made good proficiency. A few lovers of that art collected ſome diſperſed panes from ancient buildings, particularly the late Lord Cobham, who erected a Gothic temple at Stowe, and filled it with arms of the old nobility, &c. About the year 1753, one Aſciotti, an Italian, who had married a Flemiſh woman, brought a parcel of painted glaſs from Flanders, and ſold it for a few guineas to the Honourable Mr Batemen, of Old Windſor. Upon that I ſent Aſciotti again to Flanders, who brought me 450 pieces, for which, including the expence of his journey, I paid him thirty-ſix guineas. His wife made more journeys for the ſame purpoſe;

Glaſs. poſe; and ſold her cargo to one Palmer a glazier in St Martin's lane, who immediately raiſed the price to one, two, or five guineas for a ſingle piece, and fitted up entire windows with them, and with moſaics of plain glaſs of different colours. In 1761, Paterſon, an auctioneer at Eſſex houſe in the Strand, exhibited the two firſt auctions of painted glaſs, imported in like manner from Flanders. All this manufacture conſiſted in rounds of Scripture ſtories, ſtained in black and yellow, or in ſmall figures of black and white; birds and flowers in colours, and Flemiſh coats of arms.

The colours uſed in painting or ſtaining of glaſs are very different from thoſe uſed in painting either in water or oil colours.

For black, take ſcales of iron, once ounce; ſcales of copper, one ounce; jet, half an ounce: reduce them to powder, and mix them. For blue, take powder of blue, one pound; ſal nitre, half a pound: mix them and grind them well together. For carnation, take red chalk, eight ounces; iron ſcales, and litharge of ſilver, of each two ounces; gum arabic, half an ounce: diſſolve in water; grind all together for half an hour as ſtiff as you can; then put it in a glaſs and ſtir it well, and let it ſtand to ſettle 14 days. For green, take red lead one pound; ſcales of copper, one pound; and flint, five pounds: divide them into three parts; and add to them as much ſal nitre; put them into a crucible, and melt them with a ſtrong fire; and when it is cold, powder it, and grind it on a porphyry. For gold colour, take ſilver, an ounce; antimony, half an ounce: melt them in a crucible; then pound the maſs to powder, and grind it on a copper plate; add to it yellow ochre, or brick duſt calcined again, 15 ounces; and grind them well together with water. For purple, take minium, one pound; brown ſtone, one pound; white flint, five pounds: divide them into three parts, and add to them as much ſal nitre as one of the parts; calcine, melt, and grind it as you did the green. For red, take jet, four ounces; litharge of ſilver, two ounces; red chalk, one ounce: powder them fine, and mix them. For white, take jet, two parts; white flint, ground on a glaſs very fine, one part: mix them. For yellow, take Spaniſh brown, ten parts; leaf ſilver, one part; antimony, half a part: put all into a crucible, and calcine them well.

In the windows of ancient churches, &c. there are to be ſeen the moſt beautiful and vivid colours imaginable, which far exceed any of thoſe uſed by the moderns, not ſo much becauſe the ſecret of making thoſe colours is entirely loſt, as that the moderns will not go to the charge of them, nor be at the neceſſary pains, by reaſon that this ſort of painting is not now ſo much in eſteem as formerly. Thoſe beautiful works which were made in the glaſs houſes were of two kinds.

In ſome, the colour was diffuſed through the whole ſubſtance of the glaſs. In others, which were the more common, the colour was only on one ſide, ſcarce penetrating within the ſubſtance above one-third of a line; though this was more or leſs according to the nature of the colour, the yellow being always found to enter the deepeſt. Theſe laſt, though not ſo ſtrong and beautiful as the former, were of more advantage to the workmen, by reaſon that on the ſame glaſs, though already coloured, they could ſhow other kinds of colours where there was occaſion to embroider draperies, enrich them with foliages, or repreſent other ornaments of gold, ſilver, &c. Glaſs.

In order to this, they made uſe of emery, grinding or wearing down the ſurface of the glaſs till ſuch time as they were got through the colour to the clear glaſs. This done, they applied the proper colours on the other ſide of the glaſs. By theſe means, the new colours were hindered from running and mixing with the former, when they expoſed the glaſſes to the fire, as will appear hereafter.

When indeed the ornaments were to appear white, the glaſs was only bared of its colour with emery, without tinging the place with any colour at all; and this was the manner by which they wrought their light and heightenings on all kinds of colour.

The firſt thing to be done, in order to paint or ſtain glaſs, in the modern way, is to deſign, and even colour, the whole ſubject on paper. Then they chooſe ſuch pieces of glaſs as are clear, even, and ſmooth, and proper to receive the ſeveral parts; and proceed to diſtribute the deſign itſelf, or papers it is drawn on, into pieces ſuitable to thoſe of the glaſs; always taking care that the glaſſes may join in the contours of the figures and the folds of the draperies; that the carnations, and other finer parts, may not be impaired by the lead with which the pieces are to be joined together. The diſtribution being made, they mark all the glaſſes as well as papers, that they may be known again: which done, applying every part of the deſign upon the glaſs intended for it, they copy or transfer the deſign upon this glaſs with the black colour diluted in gum water, by tracing and following all the lines and ſtrokes as they appear through the glaſs with the point of a pencil.

When theſe ſtrokes are well dried, which will happen in about two days, the work being only in black and white, they give a ſlight waſh over with urine, gum arabic, and a little black; and repeat it ſeveral times, according as the ſhades are deſired to be heightened; with this precaution, never to apply a new waſh till the former is ſufficiently dried.

This done, the lights and riſings are given by rubbing off the colour in their reſpective places with a wooden point, or the handle of the pencil.

As to the other colours above mentioned, they are uſed with gum water, much as in painting in miniature; taking care to apply them lightly, for fear of effacing the outlines of the deſign; or even, for the greater ſecurity, to apply them on the other ſide; eſpecially yellow, which is very pernicious to the other colours, by blending therewith. And here too, as in pieces of black and white, particular regard muſt always be had not to lay colour on colour, or lay on a new lay, till ſuch time as the former are well dried.

It may be added that the yellow is the only colour that penetrates through the glaſs, and incorporates therewith by the fire; the reſt, and particularly the blue, which is very difficult to uſe, remaining on the ſurface, or at leaſt entering very little. When the painting of all the pieces is finiſhed, they are carried to the furnace or oven to anneal or bake the colours.

The furnace here uſed is ſmall, built of brick, from 18 to 30 inches ſquare. At ſix inches from the bottom is an aperture to put in the fuel and maintain the fire.

Glaſs. fire. Over this aperture is a grate made of three ſquare bars of iron, which traverſe the furnace, and divide it into two parts. Two inches above this partition is another little aperture, through which they take out pieces to examine how the coction goes forward. On the grate is placed a ſquare earthen pan, ſix or ſeven inches deep, and five or ſix inches leſs every way than the perimeter of the furnace. On the other ſide hereof is a little aperture, through which to make trials, placed directly oppoſite to that of the furnaces deſtined for the ſame end. In this pan are the pieces of glaſs to be placed in the following manner: Firſt, The bottom of the pan is covered with three ſtrata or layers of quicklime pulverized; thoſe ſtrata being ſeparated by two others of old broken glaſs, the deſign whereof is to ſecure the painted glaſs from the too intenſe heat of the fire. This done, the glaſſes are laid horizontally on the laſt or uppermoſt layer of lime.

The firſt row of glaſs they cover over with a layer of the ſame powder an inch deep; and over this they lay another range of glaſſes, and thus alternately till the pan is quite full; taking care that the whole heap always end with a layer of the lime powder.

The pan being thus prepared, they cover up the furnace with tiles, on a ſquare table of earthen ware, cloſely luted all round; only leaving five little apertures, one at each corner, and another in the middle, to ſerve as chimneys. Things thus diſpoſed, there remains nothing but to give the fire to the work. The fire for the firſt two hours muſt be very moderate, and muſt be increaſed in proportion as the coction advances, for the ſpace of ten or twelve hours; in which time it is uſually completed. At laſt the fire, which at firſt was charcoal, is to be of dry wood, ſo that the flame covers the whole pan, and even iſſues out at the chimneys.

During the laſt hours, they make eſſays, from time to time, by taking out pieces laid for the purpoſe through the little aperture of the furnace and pan, to ſee whether the yellow be perfect, and the other colours in good order. When the annealing is thought ſufficient, they proceed with great haſte to extinguiſh the fire, which otherwiſe would ſoon burn the colours, and break the glaſſes.

GLASS Balls, which are circular, or otherwiſe ſhaped hollow veſſels of glaſs, may be coloured within, ſo as to imitate the ſemipellucid gems. The method of doing it is this: make a ſtrong ſolution of ichthyocolla, or iſinglaſs, in common water, by boiling; pour a quantity of this while warm into the hollow of a white glaſs veſſel; ſhake it thoroughly about, that all the ſides may be wetted, and then pour off the reſt of the moiſture. Immediately after this, throw in red lead, ſhake it and turn it about, throw it into many places with a tube, and the moiſture will make it ſtick and run in waves and pretty figures. Then throw in ſome of the painters blue ſmalt, and make it run in waves in the ball as the red lead; then do the ſame with verdigriſe, next with orpiment, then with red lake, all well ground; always caſting in the colours in different places, and turning the glaſs, that the moiſture within may run them into the waves. Then take fine plaſter of Paris, and put a quantity of it into the ball; ſhake it alſo nimbly about; this will everywhere ſtick firmly to the glaſs, and give it a ſtrong inner coat, keeping all the colours on very fairly and ſtrongly. Theſe are ſet on Glaſs. frames of carved wood, and much eſteemed as ornaments in many places.

GLASS Drop. See *RUPERT'S Drops.*

Engraving on GLASS. Profeſſor Beckmann has proved, that ſo early as the year 1670 the art of etching upon glaſs was diſcovered by Henry Schwanhard, ſon of George Schwanhard, who was a celebrated glaſs-cutter, patronized by the emperor Ferdinand III. about the middle of the laſt century. At the time of his death, 1667, the father practiſed his art at Prague and Ratiſbon. Whether the ſon followed the ſame buſineſs at the ſame towns, or removed to Nuremberg, is not very evident; but in the year above mentioned, ſome *aqua-regia* (nitro-muriatic acid) having accidentally fallen on his ſpectacles, he was ſurpriſed to find the glaſs corroded by it, and become quite ſoft. He thus, it is ſaid, found himſelf in poſſeſſion of a liquid by which he could etch writing and figures upon plates of glaſs.

But it is probable, as Beckmann ſeems to think, that he had diſcovered the fluoric acid itſelf; for in the year 1725 there appeared in a periodical work the following receipt for making a powerful acid, by which figures of every kind can be etched upon glaſs.

"When the *ſpiritus nitri per diſtillationem* has paſſed into the recipient, ply it with a ſtrong fire, and when well dephlegmated, pour it, as it corrodes ordinary glaſs, into a Weldenberg flaſk. Then throw into it a pulverized green Bohemian emerald, otherwiſe called *heſphorus*, (which, when reduced to powder, and heated, emits in the dark a green light), and place it in warm ſand for 24 hours. Take a piece of glaſs well cleaned, and freed from all greaſe by means of a ley; put a border of wax round it, about an inch in height, and cover it all over with the above acid. The longer you let it ſtand ſo much the better; and at the end of ſome time the glaſs will be corroded, and the figures which have been traced out with ſulphur and varniſh will appear as if raiſed above the pane of glaſs."

That the Bohemian emerald or *heſphorus* mentioned in this receipt is green ſparry fluor, cannot, ſays the profeſſor, be doubted; and he ſeems to have as little doubt of the receipt itſelf having paſſed from Schwanhard and his ſcholars to the periodical work of 1725, from which it was inſerted in the Oekonomiſche Encyclopedie of Krunitz. This ſuppoſition certainly acquires a conſiderable degree of probability from the ſimilarity of Schwanhard's method of etching to that which is here recommended, and which is ſo different from what is now followed. At preſent, the glaſs is covered with a varniſh either of iſinglaſs diſſolved in water, or of turpentine oil mixed with a little white lead, through which the figures to be etched are traced as on copper; but Schwanhard, when he had drawn his figures, covered them with varniſh, and then by his liquid corroded the glaſs around them. His figures, therefore, when the varniſh was removed, remained ſmooth and clear, appearing raiſed from a dim or dark ground; and M. Beckmann, who perſuaded ſome ingenious artiſts to make trial of this ancient method of etching, declares, that ſuch figures have a much better effect than thoſe which are cut into the glaſs.

Foliating of GLASS. See *FOLIATING and LOOKING-glaſs.*

Glaſs. *Gilding of* GLASS. See GILDING.

Impreſſions of antique Gems taken in GLASS. See GEMS.

GLASS of Lead, a glaſs made with the addition of a large quantity of lead, of great uſe in the art of making counterfeit gems. The method of making it is this: Put a large quantity of lead into a potter's kiln, and keep it in a ſtate of fuſion with a moderate fire, till it is calcined to a gray looſe powder; then ſpread it in the kiln, and give it a greater heat, continually ſtirring it to keep it from running into lumps; continue this ſeveral hours, till the powder become of a fair yellow; then take it out, and ſift it fine: this is called *calcined lead*. Take of this calcined lead 45 pounds, and cryſtalline or other frit 12 pounds; mix theſe as well as poſſible together; put them into a pot, and ſet them in the furnace for ten hours; then caſt the whole, which will be now perfectly melted, into water; ſeparate the looſe lead from it, and return the metal into the pot; and after ſtanding in fuſion 12 hours more, it will be fit to work. It is very tender and brittle, and muſt be worked with great care, taking it ſlowly out of the pot, and continually wetting the marble it is wrought upon.

It is well known that ceruſe or white lead, minium, litharge, and all the other preparations and calces of lead, are eaſily fuſed by a moderate fire, and formed into a tranſparent glaſs of a deep yellow colour. But this glaſs is ſo penetrating and powerful a flux, that it is neceſſary to give it a greater conſiſtence, in order to render it fit for uſe. With this view, two parts of calx of lead, *e. g.* minium, and one part of ſand or powdered flints, may be put into a crucible of refractory clay, and baked into a compact body. Let this crucible, well cloſed with a luted lid, be placed in a melting furnace, and gradually heated for an hour, or an hour and a half; and afterwards let the heat be increaſed ſo as to obtain a complete fuſion, and continued in that ſtate for the ſame time: let the crucible remain to cool in the furnace; and when it is broken a very tranſparent yellow coloured glaſs will be found in it. Some add nitre and common ſalt to the above mixture, becauſe theſe ſalts promote the fuſion and the more equal diſtribution of the ſand. This glaſs of lead has a conſiderable ſpecific gravity, and its loweſt part is always the heavieſt. It is an important flux in the aſſays of ores to facilitate their ſcorification.

Glaſs of lead is capable of all the colours of the gems in very great perfection. The methods of giving them are theſe: for green, take pulverine frit 20 pounds, lead calcined 16 pounds; ſift both the powders very fine; then melt them into a glaſs, ſeparating the unmixed lead, by plunging the maſs in water; after this return it into the pot, and add braſs thrice calcined ſix ounces, and one pennyweight of crocus martis made with vinegar; put this in at ſix different times, always carefully mixing it together, and take a proof of it; when the colour is right, let it ſtand eight hours, and then work it. If inſtead of the calcined braſs the ſame quantity of the caput mortuum of the vitriolum veneris be uſed, the green is yet much finer.

For topaz colour, take cryſtal frit 15 pounds, calcined lead 12 pounds; mix them well together, by ſifting the powders through a fine ſieve; then ſet them in a furnace not too hot, and ſeparate the ſuperfluous unmixed lead, by caſting the whole into water; repeat this twice: then add half gold yellow glaſs, and let them incorporate and purify, and they will be of the true and exact colour of the oriental topazes. Glaſs.

For ſea green, take cryſtal frit 16 pounds, calcined lead 10 pounds; mix and ſift them together, and ſet them in a pot in a furnace; in 12 hours the whole will be melted; then caſt it into water, and ſeparate it from the looſe lead; put them into the furnace again for eight hours; then ſeparate the looſe lead by waſhing a ſecond time, and return it to the pot for eight hours more.

Muſcovy GLASS. See MICA, MINERALOGY *Index*.

Painting on GLASS *by means of Prints*. See *BACK-painting*.

GLASS Porcelain, the name given by many to a modern invention of imitating the china ware with glaſs. The method given by M. Reaumur, who was the firſt that carried the attempt to any degree of perfection, is ſhortly this: The glaſs veſſels to be converted into porcelain are to be put into a large earthen veſſel, ſuch as the common fine earthen diſhes are baked in, or into ſufficiently large crucibles; the veſſels are to be filled with a mixture of fine white ſand, and of fine gypſum or plaſter ſtone burnt into what is called plaſter of Paris, and all the interſtices are to be filled up with the ſame powder, ſo that the glaſs veſſels may nowhere touch either one another, or the ſides of the veſſel they are baked in. The veſſel is to be then covered down and luted, and the fire does the reſt of the work; for this is only to be put into a common potter's furnace, and when it has ſtood there the uſual time of the baking the other veſſels, it is to be taken out, and the whole contents will be found no longer glaſs, but converted into a white opaque ſubſtance, which is a very elegant porcelain, and has almoſt the properties of that of China.

The powder which has ſerved once will do again as well as freſh, and that for a great many times: nay, it ſeems, ever ſo often. The cauſe of this transformation, ſays Macquer, is probably that the vitriolic acid of the gypſum quits its baſis of calcareous earth, and unites with the alkaline ſalt and ſaline earth of the glaſs, with which it forms a kind of ſalt, different from the calcareous ſelenite, by the interpoſition of which matter the glaſs acquires the qualities of porcelain.

GLASS Pots, the veſſels in the glaſs trade uſed for melting the glaſs. Thoſe for the white glaſs works are made of a tobacco pipe clay, brought from the iſle of Wight, which is firſt well waſhed, then calcined, and afterwards ground to a fine powder in a mill; which being mixed with water, is then trod with the bare feet till it is of a proper conſiſtence to mould with the hands into the proper ſhape of the veſſels. When theſe are thus made, they are afterwards annealed over the furnace. Thoſe for the green glaſs works are made of the nonſuch, and another ſort of clay from Staffordſhire; they make theſe ſo large as to hold three or four hundred weight of metal. And beſides theſe, they have a ſmall ſort called piling pots, which they ſet upon the larger, and which contain a finer and more nice metal fit for the niceſt works.

The clay that is uſed for this purpoſe ſhould be of the pureſt and moſt refractory kind, and well cleanſed from all ſandy, ferruginous, and pyritous matters; and

Glaſs. to this it will be proper to add ground crucibles, white ſand, calcined flints duly levigated, or a certain proportion of the ſame clay baked, and pounded not very finely. The quantity of baked clay that ought to be mixed with the crude clay, to prevent the pots from cracking when dried, or expoſed to a great heat, is not abſolutely determined, but depends on the quality of the crude clay, which is more or leſs fat. M. D'Antic, in a memoir on this ſubject, propoſes the following method of aſcertaining it: The burnt and crude clay, being mixed in different proportions, ſhould be formed into cakes, one inch thick, and four inches long and wide. Let theſe cakes be ſlowly dried, and expoſed to a violent heat, till they become as hard and as much contracted as poſſible, and in this ſtate be examined; and the cake, he ſays, which has ſuffered a diminution of its bulk equal only to an eighteenth part, is made of the beſt proportions. He obſerves, in general, that moſt clays require that the proportion of the burnt ſhould be to the freſh as four to five.

Tin GLASS, the ſame with Biſmuth. See BISMUTH, CHEMISTRY *Index*.

GLASSES are diſtinguiſhed, with regard to their form, uſe, &c. into various kinds, as drinking glaſſes, optical glaſſes, looking glaſſes, burning glaſſes, &c.

Drinking GLASSES, are ſimple veſſels of common glaſs or cryſtal, uſually made in form of an inverted cone.

Each glaſs conſiſts of three parts, viz. the bowl, the bottom, and the foot; which are all wrought or blown ſeparately.

Nothing can be more dexterous and expeditious than the manner of blowing theſe parts: two of them opened, and all three joined together. An idea is only to be had thereof, by ſeeing it actually done. For the method of gilding the edges of drinking glaſſes, ſee *GILDING on Enamel and Glaſs*.

Optical GLASSES. See OPTICS.

The improvements hitherto made in teleſcopes by means of combining lenſes made of different kinds of glaſs, though very great, are yet by no means adequate to the expectations that might reaſonably be formed if opticians could fall on any method of obtaining pieces of glaſs ſufficiently large for purſuing the advantages of Mr Dollond's diſcovery. Unfortunately, however, though the board of longitude have offered a conſiderable reward for bringing this art to the requiſite perfection, no attempt of any conſequence has hitherto been made. Mr Keir is of opinion, that the accompliſhment of this is by no means an eaſy taſk; as it requires not only a competent knowledge of the properties of glaſs fitteſt for the purpoſe (the faults not being evident to common inſpection), but a conſiderable degree of chemical knowledge is alſo neceſſary in order to invent a compoſition by which theſe faults may be avoided; and laſtly, a kind of dexterity in the execution of the work, which can only be acquired by practice. Our author, however, thinks, that if the ſubject were more generally underſtood, and the difficulties more fully pointed out, for which purpoſe he makes the following remarks, the end may be more eaſily accompliſhed.

1. The rays of light paſſing through a glaſs lens or priſm, or through any other medium of unequal thickneſs, are refracted; but not in an equal manner, the blue, violet, &c. being more refracted than the red.

2. Hence it happens, that the rays of light, when refracted by a common lens, do not all unite in one focus, but in reality form as many different foci as there are colours; and hence ariſe the priſmatic colours, or iriſes, which appear towards the borders of the image formed by the common convex lenſes, and which render the viſion extremely indiſtinct. Glaſs.

3. The indiſtinctneſs of viſion produced by this cauſe, which is ſenſible in teleſcopes of a ſmall aperture, increaſes in ſo great a proportion, viz. as the cubes of the diameters, that it ſeemed impoſſible to increaſe the power of dioptric teleſcopes greatly, without extending them to a very inconvenient length, unleſs this confuſion of colours could be corrected.

4. It was known that different tranſparent bodies poſſeſſed different degrees of refractive power; and until Mr Dollond diſcovered the contrary, it was ſuppoſed, that the refractions of the coloured rays were always in a determined ratio to one another. On this ſuppoſition it ſeemed impoſſible to correct the faults of refracting teleſcopes: for it was ſuppoſed, that if the diſperſion of light produced by a convex lens were counteracted by another lens or medium of a concave form, the refraction would be totally deſtroyed; and this indeed would be the caſe, if the two mediums were made of the ſame matter; and from ſome experiments made by Sir Iſaac Newton, this was ſuppoſed to be actually the caſe in all ſubſtances whatever.

5. From conſidering that the eyes of animals are formed of mediums of different colours, it occurred firſt to Mr David Gregory, the celebrated profeſſor of aſtronomy at Oxford, and then to Mr Euler, that, by a combination of mediums which had different refractive powers, it might be poſſible to remedy the imperfections of dioptric teleſcopes. It does not, however, appear, that either of theſe gentlemen underſtood the true principle on which theſe phenomena depend. Mr Euler executed his idea by forming a compound object lens from two glaſs lenſes with water interpoſed, but his attempt was not attended with ſucceſs. Mr Dollond, however, was led by ſome arguments adduced by Mr Klingenſtierna of Sweden, to repeat one of Sir Iſaac Newton's experiments, and which had induced even that great philoſopher himſelf to ſuppoſe that the improvement afterwards executed by Mr Dollond was impoſſible. This experiment was made by Sir Iſaac Newton, by placing a glaſs priſm within a priſmatic veſſel filled with water, in ſuch a manner that the rays of light which were refracted by the glaſs priſm ſhould paſs through and be refracted in a contrary direction by the water priſm. In this manner the refraction of the light was entirely deſtroyed. But when Mr Dollond repeated the experiment, he found, that, contrary to his own expectations, when the angles of the two priſms were ſo proportioned that they counteracted each other's mean refraction, then colours appeared; and on the other hand, when they were ſo proportioned that the diſperſion of the coloured rays was counteracted, the mean refraction ſtill ſubſiſted; which evidently proved, that the mean refractive and diſperſive powers of glaſs and water were not proportional to one another.

6. To apply this to the propoſed improvement, Mr Dollond examined ſeveral kinds of glaſs. Crown glaſs was found to poſſeſs the ſmalleſt diſperſive power in proportion to its refraction; while flint glaſs poſſeſſed

Glaſs. the greateſt diſperſive power in proportion to its refraction, which was alſo very great. On comparing theſe two exactly together, he found, that a wedge of white flint glaſs whoſe angle was about 25 degrees, and another of crown glaſs whoſe angle was 29 degrees, refracted very nearly alike. He found alſo, that, when the wedges were ground to ſuch angles, the refraction produced by the flint glaſs was to that produced by the crown glaſs nearly as two to three; the refracted light was then free from colour. On meaſuring the general refracting powers of theſe two glaſſes, he found, that in flint glaſs, the ſine of incidence of the rays was to the ſine of mean refraction as 1 to 1.583; and that in crown glaſs, the ſine of incidence was to the ſine of mean refraction as 1 to 1.53.

The methods of determining the different refractive powers of glaſs are given under the article Optics. Here we ſhall only obſerve, that two kinds of glaſs are neceſſary for the conſtruction of achromatic teleſcopes; one of which ſhall poſſeſs as ſmall, and the other as great, diſperſive powers, relative to their mean refracting powers, as can be produced. The difference of glaſſes in this reſpect depends on the quality of the ingredients employed in their compoſition. Crown glaſs, which is compoſed of ſand melted by means of the aſhes of ſea weeds, barilla, or kelp, both which fluxes are known to conſiſt of vegetable earth, alkali, and neutral ſalt, is found to give the ſmalleſt diſperſive power. Plate glaſs, which conſiſts of ſand melted by means of fixed vegetable alkali, with little or no vegetable earth, gives a greater diſperſive power; but both theſe give much leſs than flint glaſs, which conſiſts of ſand melted by means of minium and fixed alkali. It appears, therefore, that the diſperſion of the rays is greateſt when minium, or probably other metallic calces, are made uſe of; and that alkalies give a greater power of diſperſion than vegetable or other earths. Mr Zieher of Peterſburgh, however, informs us, that he has made a kind of glaſs, much ſuperior in this reſpect to flint glaſs; but it does not as yet appear whether it be more fit for optical purpoſes than that commonly made uſe of. There ſeems no difficulty in augmenting the diſperſive power, as that is found to depend on the quantity of minium or other flux: but thus we unfortunately increaſe alſo the capital fault to which flint glaſs and all compoſitions of that kind are ſubject; namely, the being ſubject to veins or ſmall threads running through it. By theſe, even when ſo ſmall as to be imperceptible to the naked eye, the rays which fall on them are diverted from their proper direction, and thereby render the images confuſed. This is owing to the greater denſity of the veins, as appears by their image being received on white paper, when the glaſs is held between the paper and the ſun or a candle at a proper diſtance. The rays of light being then made to converge by the ſuperior denſity of the veins, their images will appear as bright lines bordered with obſcure edges on the paper. Flint glaſs is ſo much ſubject to this kind of imperfection, that it is with difficulty the opticians can pick out pieces of the ſize commonly uſed from a large quantity of the glaſs. It is farther to be regretted, that the minium which produces the greateſt diſperſive power, is likewiſe the very ſubſtance which renders flint glaſs much more ſubject to theſe imperfections than any other. The reaſon is, that the ſand and earthy matters mix uniformly in fuſion; and having not only a conſiderable degree of affinity towards each other, but alſo being not much different from each other, they are not apt to ſeparate. On the other hand, when ſuch a heavy ſubſtance as minium is added to theſe earthy ſubſtances, though it has a pretty ſtrong tendency to unite with the earthy ſubſtances, it has none with the fixed alkali, which is another ingredient in this glaſs. Hence ſome parts of the glaſs will contain more metallic matter than the reſt; particularly that near the bottom of the pot, which is ſo full of large veins as to be applied only to the making of wares of little value. The veins in this caſe are formed by the deſcent of the minium at the bottom, which in its paſſage forms threads or veins by dragging other parts of the glaſs along with them. Glaſs.

The correction of this fault appears therefore to be very difficult. M. Macquer informs us, that he had in vain tried to remove it by very long fuſion and a fierce fire; which indeed others have found by experience not to correct, but to augment the evil. Mr Keir is of opinion that ſome new compoſition muſt be diſcovered, which, along with a ſufficient refractive power, ſhould poſſeſs a greater uniformity of texture; but he is likewiſe of opinion, that ſcarce any alteration in this reſpect could be made without injuring the colour of the glaſs. For optical purpoſes, however, our author does not think that an alteration in the colour of the ingredients would be very detrimental. "I am convinced (ſays he), that glaſſes ſenſibly tinged with colour, might tranſmit as much or more light than the beſt flint glaſs. For the colourleſs appearance of flint glaſs is an optical deception. The minium gives it a conſiderable tinge of yellow, and the alkali inclines it to a bluiſh caſt, beſides the colour ariſing from a greater or leſs impurity of the materials; ſo that the glaſs would actually be very ſenſibly coloured, unleſs by the addition of manganeſe, which is known to give a purpliſh red. Thus the other tinges are counteracted, but not effaced or deſtroyed as has been frequently imagined. By the mixture of the three principal colours, red, yellow, and blue, more or leſs exactly counterpoiſed, a certain dark ſhade is introduced, in which, as not any one of the colours predominates, no coloured tinge appears, but the effect is merely a diminution of the tranſparency of the glaſs, which, however, is too ſmall for ordinary obſervation." Mr Keir is even of opinion, that a certain tinge of yellow would in many caſes be of ſervice, becauſe it would exclude ſome of the blue rays, which being moſt refrangible are moſt injurious to the diſtinctneſs of viſion.

Very conſiderable difficulties, however, muſt ariſe in attempting improvements of this kind; as the experiments muſt all be tried on a very large ſcale. This is not only attended with a very heavy expence in itſelf on account of the quantity of materials employed, but from the heavy duty of exciſe which is rigorouſly exacted whether the glaſs be manufactured into ſaleable articles or not. It is obſerved in the manufacture of every kind of glaſs, that the glaſs in the middle of the area or tranſverſe ſection of a pot is much purer and freer from veins and other imperfections than the part which is near the ſides, and that the glaſs at the bottom is the worſt of all. Conſequently it is chiefly in large pots, ſuch as are uſed in manufactures, that there

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Glaſs, Glaſtonbury.

is a probability of ſucceſs. Very fine and beautiful glaſſes, called *paſte* and *artificial gems*, may be made in ſmaller pots or crucibles; but this glaſs is ſuffered to cool and ſubſide in the veſſel, by which means the contiguous parts are more uniform in their texture than can be expected in a piece of glaſs taken out of the pot while hot in the common way, by making it adhere and twiſt round an iron rod or pipe. But although the method of allowing the glaſs to cool in the pots is very advantageous for the purpoſes of the jeweller, it is by no means applicable to thoſe of the optician. Glaſs cooled in that gradual manner, ſuffers ſome degree of cryſtallization or peculiar arrangement of its parts; the conſequence of which is, that the rays of light undergo certain refractions independent on the form of the glaſs, which greatly affect the diſtinctneſs of viſion in teleſcopes.

Muſical GLASSES. See HARMONICA.

Looking GLASSES. See *LOOKING Glaſs*, MIRROR, and FOLIATING.

Burning GLASS. See *BURNING Glaſs*.

Weather GLASS. See BAROMETER.

Cupping GLASS. See SURGERY.

Hour GLASS. See *HOUR Glaſs*.

Watch GLASS. See WATCH.

Glass Wort. See SALSOLA, BOTANY *Index*.

GLASTONBURY, a town of Somerſetſhire in England; ſituated in W. Long. 2. 41. N. Lat. 51. 9. —It is noted for a famous abbey, ſome magnificent ruins of which ſtill remain. The curious ſtructure called *the Abbot's kitchen* is ſtill pretty entire. The monks pretend that it was the reſidence of Joſeph of Arimathea, and of St Patrick. The king of the Weſt Saxons erected a church here, which he and the ſucceeding kings enriched to ſuch a degree, that the abbot lived like a prince, had the title of *lord*, and ſat among the barons in parliament; and no perſon, not even a biſhop or prince, durſt ſet foot on the iſle of Avalon, in which the abbey ſtands, without his leave. The revenue of the abbey was above 40,000l. per ann. beſides ſeven parks well ſtocked with deer. The laſt abbot (Richard Whiting), who had 100 monks, and 300 domeſtics, was hanged in his pontificals, with two of his monks, on the Tor, a high hill in the neighbourhood, for refuſing to take the oath of ſupremacy to Henry VIII. and ſurrender his abbey when required. Edgar and many other Saxon kings were buried here; and, as ſome will have it, Arthur the Britiſh king. Every cottage here has part of a pillar, a door, or a window of this fabric; of which there ſtill remain the ruins of the choir, the middle tower and the chapels. The walls that remain of the abbey are overgrown with ivy, and the aſpect of the whole is both melancholy and venerable. Here are two pariſh churches. This town, while under the protection of its abbots, was a parliamentary borough, but it loſt that and its privilege of a corporation; the latter of which was, however, reſtored by Queen Anne, who granted it a new charter for a mayor and burgeſſes. The only manufactory here is ſtockings. At a little diſtance from the old church, and facing the monks churchyard, are two remarkable pyramids, with inſcriptions, that are in characters unintelligible, and an image in biſhop's veſtments. The ſtory of the Glaſtonbury thorn, and of its budding upon Chriſtmas day, is well known. This is not correctly true; but if the winter is mild, it always buds about the latter end of December, but later if the weather is ſevere.

Glaſtonbury || Glazing.

GLATZ, a ſtrong town of Sileſia, capital of a county of the ſame name, ſeated on the river Neiſſe; and well fortified with a caſtle. The town contains 400 houſes, and as many in the ſuburbs. The county was ceded to the king of Pruſſia by the queen of Hungary in 1742; and is about 45 miles in length, and 25 in breadth. It has mines of pit coal, ſilver, and iron; good quarries, plenty of cattle, and fine ſprings of mineral water. The town is ſituated in E. Long. 16. 26. N. Lat. 50. 16.

GLAUBER, JOHN RHODOLPHUS, a celebrated German chemiſt, who flouriſhed about the year 1646. He wrote a great number of different treatiſes on chemiſtry, ſome of which have been tranſlated into Latin and French. All his works have been collected into one volume, entitled *Glauberus concentratus*, which was tranſlated into Engliſh, and printed at London, in folio, in 1689.

GLAUBER'S Salts, or *Sulphate of Soda*. See CHEMISTRY *Index*.

GLAUCOMA, in *Medicine* and *Surgery*, the name of a diſeaſe in the eye, wherein the cryſtalline humour is turned of a bluiſh or greeniſh colour, and its tranſparency hereby diminiſhed.—The word comes from γλαυκος, *cæſius*, "ſea-green, ſky coloured or grayiſh."

Thoſe in whom this diſorder is forming, diſcover it hence, that all objects appear to them as through a cloud or miſt; when entirely formed, the viſual rays are all intercepted, and nothing is ſeen at all.

It is reckoned incurable, when inveterate, and in aged perſons: and even under other circumſtances, is very difficult of cure, externals proving of little ſervice.

The internals beſt ſuited to it, are thoſe uſed in the gutta ſerena. Jul. Cæſar Claudinus, Conſul. 74. gives a remedy for the glaucoma.

The glaucoma is uſually diſtinguiſhed from the cataract or ſuffuſion, in this, that in the cataract the whiteneſs appears in the pupil, very near the corner; but it ſhows deeper in the glaucoma. See SURGERY *Index*.

GLAUCUS, a marine god, or deity of the ſea. There are a great many fabulous accounts of this divinity: but in the poetical hiſtory of him is, that before his deification, he was a fiſherman of the town of Anthedon, who having one day taken a conſiderable number of fiſhes, which he laid upon the bank, on a ſudden perceived, that theſe fiſhes, having touched a kind of herb that grew on the ſhore, received new ſtrength, and leaped again into the ſea: upon the ſight of which extraordinary accident, he was tempted to taſte of the herb himſelf, and preſently leaped into the ſea after them, where he was metamorphoſed into a Triton, and became one of the ſea gods.

GLAUX, a genus of plants belonging to the pentandria claſs, and in the natural method ranking under the 17th order, *Calycanthemæ*. See BOTANY *Index*.

GLAZIER, an artificer who works in glaſs.—The principal part of a glazier's buſineſs conſiſts in fitting panes of glaſs to the ſaſhes and window frames of houſes, pictures, &c. and in cleaning the ſame.

GLAZING, the cruſting over earthen ware with a vitreous ſubſtance, the baſis of which is lead. See *GLASS of Lead*.

The workers of common earthen ware, however, are not

Glazing. not at the trouble of thus previouſly making a pure glaſs of lead. Their uſual compoſition for glazing their ware is formed of white ſand 40 pounds, of red lead 20 pounds, of pearl aſhes 20 pounds, and of common ſalt 12 pounds. Powder the ſand by grinding it, and then add it to the other ingredients and grind them together: after which calcine them for ſome time with a moderate heat, and when the mixture is cold, pound it to powder; and when wanted for uſe temper it with water. The proportion of theſe ingredients may be occaſionally varied. The ware after being turned on the wheel and dried in the open air, is covered over with the above compoſition by means of a bruſh; and when ſet in the furnace the violent heat ſoon reduces it to a perfect glaſs, covering the whole internal and external ſurface of the veſſel.

We may obſerve, however, in general, that lead ought to be excluded from the compoſition of glazings, and other fluxes ſubſtituted in its ſtead. A tranſparent glazing may be prepared without lead, by calcining 40 pounds of white ſand, 25 pounds of pearl aſhes, and 15 pounds of common ſalt; and proceeding as before: and a more perfect tranſparent glazing may be made of ſand 40 pounds, of wood aſhes perfectly burnt 50 pounds, of pearl aſhes 10 pounds, and of common ſalt 12 pounds. The following receipts are taken for the moſt part from Kunckel, who ſays, that they are the true glazings uſed at Delft and other Dutch manufactories.

Black is made of eight parts of red lead, iron filings three, copper aſhes three, and zaffer two meaſures. This when melted will make a brown black; and if you want it blacker, add more zaffer to it.

Blue is thus prepared: Take lead aſhes or red lead one pound, clear ſand or powdered flints two pounds, common ſalt two pounds, white calcined tartar one pound, Venice or other glaſs half a pound, zaffer half a pound; mix them well together and melt them for ſeveral times, quenching them always in cold water. If you would have it fine and good, it will be proper to put the mixture into a glaſs furnace for a day or two.

Another blue glazing may be formed of one pound of tartar, a quarter of a pound of red lead, half an ounce of zaffer, and a quarter of a pound of powdered flints, which are to be fuſed and managed as in the laſt receipt. Or, take two pounds of calcined lead and tin, add five pounds of common ſalt, five pounds of powdered flints, and of zaffer, tartar, and Venetian glaſs, each one pound. Calcine and fuſe the mixture as before. Or, again, take of red lead one part, of ſand three parts, and of zaffer one part. For a violet blue glazing, take four ounces of tartar, two ounces of red lead, five ounces of powdered flints, and half a drachm of manganeſe.

Brown is made of red lead and flints of each 14 parts, and of manganeſe two parts fuſed; or of red lead 12 parts, and manganeſe one part fuſed. A brown glazing, to be laid on a white ground, may be made of manganeſe two parts, and of red lead and white glaſs of each one part, twice fuſed.

Fleſh coloured is made of 12 parts of lead aſhes, and one of white glaſs.

Gold coloured. Take of litharge three parts, of ſand or calcined flint one part; pound and mix theſe very well together, then run them into a yellow glaſs with a ſtrong fire. Pound this glaſs, and grind it into a ſubtile powder, which moiſten with a well ſaturated ſolution of ſilver; make it into a paſte, which put into a crucible, and cover it with a cover. Give at firſt a gentle degree of fire; then increaſe it, and continue it till you have a glaſs, which will be green. Pound this glaſs again, and grind it to a fine powder; moiſten this powder with ſome beer, ſo that by means of a hair pencil you may apply it upon the veſſels or any piece of earthen ware. The veſſels that are painted or covered over with this glazing muſt be firſt well heated, then put under a muffle; and as ſoon as the glaſs runs, you muſt ſmoke them, by holding them over burning vegetables, and take out the veſſels. Mr Heinſius of Peterſburgh, who ſent this receipt to the Royal Society, uſes the words *afflare debes fumum*, which is rendered *ſmoke them*, in the Tranſactions. Phil. Tranſ. N° 465. § 6. Glazing.

Kunckel gives ſeveral preparations for a gold coloured yellow glazing. This may be produced by fuſing a mixture of three parts of red lead, two parts of antimony, and one part of ſaffron of Mars; by again melting the powdered maſs, and repeating the operation four times, or by fuſing four or five times a compoſition of red lead and antimony of each an ounce, and of ſcales of iron half an ounce: or by calcining and fuſing together eight parts of red lead, ſix parts of flints, one part of yellow ochre, one part of antimony, and one part of white glaſs. A tranſparent gold-coloured glazing may be obtained by twice fuſing red lead and white flints, of each 12 parts, and of filings of iron one part.

Green may be prepared of eight parts of litharge or red lead, eight parts of Venice glaſs, four parts of braſs duſt or filings of copper; or of ten parts of litharge, twelve of flint or pebble, and one of *æs uſtum* or copper aſhes.—A fine green glazing may be produced by fuſing one part of the Bohemian granate, one part of filings of copper, one part of red lead, and one part of Venetian glaſs; or by fuſing one part of white glaſs, the ſame quantity of red lead, and alſo of filings of copper; powdering the maſs, and adding one part of Bohemian granate to two parts of this powder. A fine green may be obtained by mixing and grinding together any of the yellow glazings with equal quantities of the blue glazings; and all the ſhades and teints of green will be had by varying the proportion of the one to the other, and by the choice of the kind of yellow and blue.

Sea green is made of five pounds of lead aſhes, one pound of tin aſhes, three pounds of flint, three quarters of a pound of ſalt, half a pound of tartar, and half a pound of copper duſt.

Iron colour is prepared of 15 parts of lead aſhes or red lead, 15 of white ſand or flints, and five of calcined copper. This mixture is to be calcined and fuſed.

Liver colour is prepared of 12 parts of litharge, eight of ſalt, ſix of pebble or flint, and one of manganeſe.

Purple brown conſiſts of lead aſhes 15 parts, clean ſand or powdered flints 18 parts, manganeſe one part, and white glaſs 15 meaſures, to which ſome add one meaſure of zaffer.

Red

Glazing. *Red* is made of antimony three pounds, litharge or red lead three, and ruſt of iron one: grind them to a fine powder. Or, take two pounds of antimony, three of red lead, and one of calcined ſaffron of Mars, and proceed as before.

White. The white glazing for common ware is made of 40 pounds of clear ſand, 75 pounds of litharge or lead aſhes, 26 of pot aſhes, and ten pounds of ſalt: theſe are three times melted into a cake, quenching it each time in clear cold water. Or it may be made of 50 pounds of clean ſand, 70 of lead aſhes, 30 of wood aſhes, and 12 of ſalt.

For a fine white: Take two pounds of lead and one of tin; calcine them to aſhes: of this take two parts, calcined flint, white ſand, or broken white glaſs, one part, and ſalt one part; mix them well together and melt them into a cake for uſe. The trouble of calcining the tin and lead may be prevented by procuring them in a proper ſtate.

A very fine white glazing may be obtained by calcining two parts of lead and one part of tin; and taking one part of this maſs, and of flints and common ſalt of each one part, and fuſing the mixture.

A white glazing may be alſo prepared by mixing 100 pounds of maſticot, 60 pounds of red lead, 20 pounds of calcined tin or putty, and 10 pounds of common ſalt, and calcining and powdering the mixture ſeveral times.

Yellow is prepared of red lead three pounds; calcined antimony and tin, of each two pounds; or, according to ſome, of equal quantities of the three ingredients. Theſe muſt be melted into a cake, then ground fine; and this operation repeated ſeveral times; or it may be made of 15 parts of lead ore, three parts of litharge of ſilver, and 15 parts of ſand.—A fine yellow glazing may be procured by mixing five parts of red lead, two parts of powdered brick, one part of ſand, one part of the white glazings, and two parts of antimony, calcining the mixture and then fuſing it. Or, take four parts of white glaſs, one part of antimony, three parts of red lead, and one part of iron ſcales, and fuſe the mixture; or fuſe 16 parts of flints, one part of iron filings, and 24 parts of litharge. A light yellow glazing may be produced with ten parts of red lead, three parts of antimony, and three of glaſs, and two parts of calcined tin. See *Gold colour*, above.—A *citron yellow* is made of ſix parts of red lead, ſeven parts of fine red brick duſt, and two parts of antimony. This mixture muſt be calcined day and night for the ſpace of four days, in the aſh hole of a glaſs-houſe furnace, and at laſt urged to fuſion.

For the glazing of Delft ware, Porcelain, Stoneware, &c. ſee the articles *Delft Ware*, Porcelain, and Pottery.

The Romans had a method of glazing their earthen veſſels, which in many reſpects appears to have been ſuperior to ours. The common brown glazing eaſily ſcales off, cracks, and in a ſhort time becomes diſagreeable to the eye. Beſides, it is very eaſily deſtroyed by acids; nor can veſſels glazed in this manner be even employed to hold water, without part of it oozing through their pores. Lead is alſo very deſtructive to the human body; and if acids are unwarily put into veſſels glazed with lead, the liquors will receive a very dangerous impregnation from the metal. The Roman glazing, which is yet to be ſeen upon urns dug up in ſeveral places, appears to have been made of ſome kind of varniſh; and Pliny gives us a hint that it was made of bitumen. He tells us that it never loſt its beauty, and that at length it became cuſtomary to glaze over ſtatues in this manner. As this varniſh ſunk deep into the ſubſtance of the ware, it was not ſubject to thoſe cracks and flaws which diſfigure our veſſels; and as it was not liable to be corroded by acids, it could not be ſubject to any of the accidents which may enſue from the uſe of veſſels glazed with lead. Glazing || Glendalagh.

GLEAD, or Glade, a name uſed in the northern parts of the kingdom for the kite. See Falco, Ornithology *Index*.

GLEAM is popularly uſed for a ray or beam of light. Among falconers a hawk is ſaid to gleam when ſhe caſts or throws up filth from the gorge.

GLEANING, the act of gathering or picking up the ears of corn left behind after the field has been reaped and the crop carried home. By the cuſtoms of ſome countries, particularly thoſe of Melun and Eſtampes, all farmers and others are forbid, either by themſelves or ſervants, to put any cattle into the fields, or prevent the gleaning in any manner whatever for the ſpace of 24 hours after the carrying off the corn, under the penalty of confiſcation.

GLEBE, among miners, ſignifies a piece of earth in which is contained ſome mineral ore.

Glebe, in *Law*, the land belonging to a pariſh church beſides the tithes.

GLECHOMA, Ground Ivy, a genus of plants belonging to the didynamia claſs, and in the natural method ranking under the 42d order, *Verticillatæ*. See Botany *Index*.

GLEDITSIA, Triple Thorned Acacia, or *Honey Locuſt*, a genus of plants belonging to the polygamia claſs, and in the natural method ranking under the 33d order, *Lomentaceæ*. See Botany *Index*.

GLEET, in *Medicine*, the flux of a thin limpid humour from the urethra. See Medicine *Index*.

GLENDALAGH, otherwiſe called *the Seven Churches*, anciently a celebrated town of Ireland, ſituated five miles north-weſt of Rathdrum, in the county of Wicklow, and province of Leinſter. The name ſignifies "the valley of the two lakes." In this valley, ſurrounded by high and almoſt inacceſſible mountains, St Kevin or Cavan, called alſo *St Coemgene*, about the middle of the 6th century, founded a monaſtery, which in a ſhort time from the ſanctity of its founder was much reſorted to, and at length became a biſhoprick and a religious city. St Kevin died 3d June 618, aged 120; and on that day annually numbers of perſons flock to the Seven Churches to celebrate the feſtival of that venerated ſaint. During the middle ages the city of Glendalagh, called by Hovedon *Epiſcopatus Biſtagnienſis*, was held in great eſteem, and received ſeveral valuable donations and privileges, its epiſcopal juriſdiction extending to the walls of Dublin.—About the middle of the 12th century, on ſome account or other, it was much neglected by the clergy; and became, inſtead of a holy city, a den of thieves, wherefore Cardinal Papiro, in 1214, united it to the ſee of Dublin, which union was confirmed by King John. The O'Tools, chiefs

of

Glendalagh ‖ Gliſſon.

of Firthual, however, by the aſſiſtance of the Pope, continued long after this period to elect biſhops and abbots to Glendalagh, though they had neither revenues or authority, beyond the diſtrict of Tuathal, which was the weſtern part of the county of Wicklow; in conſequence of which the city was ſuffered to decay, and had become nearly a deſert, in 1497, when Dennis White, the laſt titular biſhop, ſurrendered his right in the cathedral church of St Patrick, Dublin. From the ruins of this ancient city ſtill remaining, it appears to have been a place of conſequence, and to have contained ſeven churches and religious houſes; ſmall indeed, but built in a neat elegant ſtile, in imitation of the Greek architecture: the cathedral, the walls of which are yet ſtanding, was dedicated to St Peter and St Paul. South of the cathedral ſtands a ſmall church roofed with ſtone, nearly entire; and in ſeveral parts of the valley are a number of ſtone croſſes, ſome of which are curiouſly carved, but without any inſcriptions. In the north-weſt corner of the cemetery belonging to the cathedral ſtands a round tower, 95 feet high, and 15 in diameter; and in the cemetery of a ſmall church, on the ſouth ſide of the river, near the great lake, called the *Rhefeart church*, are ſome tombs, with Iriſh inſcriptions, belonging to the O'Tools. In a perpendicular projecting rock on the ſouth ſide of the great lake, 30 yards above the ſurface of the water, is the celebrated bed of St Kevin, hewn out of the rock, exceedingly difficult of acceſs and terrible of proſpect. Amongſt the ruins have been diſcovered a number of ſtones, curiouſly carved, and containing inſcriptions in the Latin, Greek, and Iriſh languages. As this city was in a valley, ſurrounded on all ſides, except the eaſt, by high, barren, and inacceſſible mountains, the artificial roads leading thereto are by no means the leaſt curious part of the remains; the principal is that leading into the county of Kildare through Glendaſon. This road for near two miles is yet perfect, compoſed of ſtones placed on their edges, making a firm and durable pavement, about 10 feet broad. At a ſmall diſtance from St Kevin's bed, on the ſame ſide of the mountain, are to be ſeen the ruins of a ſmall ſtone building called *Saint Kevin's cell.*

GLENOIDES, the name of two cavities, or ſmall depreſſions, in the inferior part of the firſt vertebra of the neck.

GLIMMER, or GLIST. See MICA, MINERALOGY *Index.*

GLINUS, in *Botany*, a genus of plants belonging to the decandria claſs; and in the natural method ranking under the 22d claſs, *Caryophylleæ*. See BOTANY *Index.*

GLIRES, the name of Linnæus's fourth order of mammalia. See MAMMALIA *Index.*

GLISSON, FRANCIS, a learned Engliſh phyſician in the 17th century, was educated at Cambridge, and was made regius profeſſor of that univerſity. in 1634 he was admitted a fellow of the College of Phyſicians in London. During the civil wars, he practiſed phyſic at Colcheſter, and afterwards ſettled in London. He greatly improved phyſic by his anatomical diſſections and obſervations, and made ſeveral new diſcoveries of ſingular uſe towards eſtabliſhing a rational practice. He wrote, 1. *De rachitide*, &c. 2. *De lymphæductis nuper repertis*: with the *Anatomica prolegomena, et Anatomia hepatis.* 3. *De naturæ ſubſtantia energitica; ſeu de via vitæ naturæ, ejuſque tribus primis facultatibus*, &c. quarto. 4. *Tractatus de ventriculo et inteſtinis*, &c. The world is obliged to him for the *capſula communis*, or *vagina portæ.*

Gliſſon ‖ Gloceſter.

GLISTER, in *Surgery*. See CLYSTER.

GLOBBA, a genus of plants belonging to the monandria claſs. See BOTANY *Index.*

GLOBE, in *Geometry*, a round or ſpherical body, more uſually called a *Sphere*. See SPHERE.

GLOBE is more particularly uſed for an artificial ſphere of metal, plaſter, paper, or other matter; on whoſe convex ſurface is drawn a map, or repreſentation either of the earth or heavens, with the ſeveral circles conceived theron. See GEOGRAPHY.

Globes are of two kinds, *terreſtrial* and *celeſtial*; each of very conſiderable uſe, the one in aſtronomy, and the other in geography, for performing many of the operations thereof in an eaſy obvious manner, ſo as to be conceived without any knowledge of the mathematical grounds of thoſe arts.

The fundamental parts, common to both globes, are an axis, repreſenting that of the world; and a ſpherical ſhell, or cover, which makes the body of the globe, on the external ſurface of which the repreſentation is drawn. See GEOGRAPHY *Index.*

Globes, we have obſerved, are made of different materials, viz. ſilver, braſs, paper, plaſter, &c. Thoſe commonly uſed are of plaſter and paper. For the conſtruction of globes, ſee GEOGRAPHY *Index.*

For the uſes, &c. of the globes, ſee GEOGRAPHY and ASTRONOMY.

GLOBE Animal. See ANIMALCULE.

GLOBE Fiſh. See OSTRACION, ICHTHYOLOGY *Index.*

GLOBULARIA, GLOBULAR BLUE DAISY; a genus of plants, belonging to the tetrandria claſs; and in the natural method ranking under the 48th order, *Aggregatæ*. See BOTANY *Index.*

GLOBULE, a diminutive of globe, frequently uſed by phyſicians in ſpeaking of the red particles of the blood. See BLOOD.

GLOCESTER, the capital of Gloceſterſhire, in England, 106 miles from London. It is an ancient city; and by Antoninus is called *Clevum*, or *Glevum*, which Camden thinks was formed from the Britiſh *Caer-Glowe*, ſignifying "a fair city." It was one of the 28 cities built by the Britons before the arrival of the Romans, who made it one of their colonies, and in the eighth century it was eſteemed one of the nobleſt cities in the kingdom. It has ſuffered conſiderably by fire at different periods. It ſtands upon a hill; and from the middle of the city, where the four principal ſtreets meet, there is a deſcent every way, which makes it not only clean and healthy, but adds to the beauty of the place. Forging of iron ſeems to have been its manufacture ſo early as the time of William the Conqueror. King Henry VIII. made it the ſee of a biſhop, with a dean and ſix prebends. Its caſtle, which was erected in the time of William the Conqueror, is very much decayed; part of it is leaſed out by the crown; and the reſt ſerves for a priſon, one of the beſt in England. In its cathedral, which is an ancient but magnificent fabric, and has a tower reckoned one

Gloceſter. one of the moſt curious pieces of architecture in England, are the tombs of Robert duke of Normandy, ſon to William the Conqueror, and of Edward II. and there is a whiſpering place like to that of St Paul's at London. In the chapter houſe lies Strongbow who conquered Ireland. There are 12 chapels in it, with the arms and monuments of many great perſons. King John made it a borough to be governed by two bailiffs. Henry III. who was crowned here, made it a corporation. By its preſent charter from Charles I. it is governed by a ſteward, who is generally a nobleman; a mayor; a recorder; 12 aldermen, out of whom the mayor is choſen; a town clerk; two ſheriffs, choſen yearly out of 26 common councilmen; a ſword-bearer; and four ſerjeants at mace. Here are 12 incorporated trading companies, whoſe maſters attend the mayor on all public occaſions, &c. Beſides the cathedral, there are five pariſh churches in this city; which is likewiſe well provided with hoſpitals, particularly an infirmary upon the plan of thoſe at London, Wincheſter, Bath, &c. Here is a good ſtone bridge over the river Severn, with a quay, wharf, and cuſtomhouſe; but moſt of its buſineſs is engroſſed by Briſtol. King Edward I. held a parliament here in 1272, wherein ſome good laws were made, now called the *Statutes of Gloceſter;* and he erected a gate on the ſouth ſide of the abbey, ſtill called by his name, though almoſt demoliſhed in the civil wars. King Richard II. alſo held a parliament here: and King Richard III. in conſideration of his having (before his acceſſion to the crown) borne the title of *Duke of Gloceſter*, added the two adjacent hundreds of Dudſton and King's Barton to it, gave it his ſword and cap of maintenance, and made it a county of itſelf by the name of the *county of the city of Gloceſter*. But after the Reſtoration the hundreds were taken away by act of parliament, and the walls pulled down; becauſe the city ſhut the gates againſt Charles I. when he beſieged it in 1643; by which, though the ſiege was raiſed by the earl of Eſſex, it had ſuffered 20,000l. damage, having 241 houſes deſtroyed, which reduced it ſo much that it has ſcarce recovered its former ſize and grandeur. Before that time it had 11 pariſh churches, but ſix of them were then demoliſhed. Here are abundance of croſſes, and ſtatues of the Engliſh kings, ſome of whom kept their Chriſtmas here; ſeveral market houſes ſupported with pillars; and large remains of monaſteries, which were once ſo numerous, that it gave occaſion to the monkiſh proverb, *As ſure as God is in Gloceſter*. Here is a barley market; and a hall for the aſſizes, called the *Booth Hall*. Its chief manufacture is pins. Under the bridge is a water engine to ſupply the town, and it is ſerved with it alſo from Robin Hood's well, to which is a fine walk from the city. Camden ſays, that the famous Roman way, called *Ermin Street*, which begins at St David's in Pembrokeſhire, and reaches to Southampton, paſſes through this city. Sudmead in the neighbourhood is noted for horſe races. Here is a charity ſchool for above 80 children, of whom above 70 are alſo clothed; and a well endowed blue coat ſchool. The city ſends two members to parliament. W. Long. 2. 13. N. Lat. 51. 48.

GLOCESTER is alſo the name of two counties and of ſeveral towns in America; ſuch as the county of Gloceſter in New Jerſey, bounded on the north by Burlington, on the ſouth by Salem and Cumberland, on the eaſt by the Atlantic ocean, and on the weſt by the river Delaware. It contains 13,172 inhabitants, beſides 191 ſlaves. Gloceſter in Virginia is a well cultivated and fruitful county, about 55 miles long and 30 broad, with a population of 13,498 ſouls, among whom are included 7063 ſlaves. Gloceſter, Gloceſterſhire.

GLOCESTERSHIRE, a county of England, is bounded on the weſt by Monmouthſhire and Herefordſhire, on the north by Worceſterſhire, on the eaſt by Oxfordſhire and Warwickſhire, and on the ſouth by Wiltſhire, and part of Somerſetſhire. It is ſixty miles in length, twenty-ſix in breadth, and one hundred and ſixty in circumference; containing 1,100,000 acres, 26,760 houſes, 162,560 inhabitants, 290 pariſhes, 140 are impropriations, 1229 villages, 2 cities, and 28 market towns. It ſends only 8 members to parliament, 6 for three towns, viz. Gloceſter, Tewkeſbury, and Cirenceſter; and two for the county. Its manufactures are woollen cloths of various kinds, men's hats, leather, pens, paper, bar iron, edge tools, nails, wire, tinned plates, braſs, &c.: and of the principal articles of commerce of the county, it exports cheeſe 8000 tons; bacon, grain, cyder, 5000l. worth; perry, fiſh, 4000l. worth, &c. It lies in the dioceſe that takes its name from the capital, and in the Oxford circuit. The air of the county is very wholeſome, but the face of it is very different in different parts: for the eaſtern part is hilly, and is called *Cotteſwold;* the weſtern woody, and called the *Foreſt of Dean;* and the reſt is a fruitful valley, through which runs the river Severn. This river is in ſome places between two and three miles broad; and its courſe through the county, including its windings, is not leſs than ſeventy miles. The tide of flood, called the *Boar*, riſes very high, and is very impetuous. It is remarkable, that the greateſt tides are one year at the full moon, and the other at the new; one year the night tides, and the next the day. This river affords a noble conveyance for goods and merchandiſe of all ſorts to and from the county; but it is watered by ſeveral others, as the Wye, the Avon, the Iſis, the Leyden, the Frome, the Stroud, and Windruſh, beſides leſſer ſtreams, all abounding with fiſh, the Severn in particular with ſalmon, conger eels, and lampreys. The ſoil is in general very fertile, though pretty much diverſified, yielding plenty of corn, paſture, fruit, and wood. In the hilly part of the county, or Cotteſwold, the air is ſharper than in the lowlands; and the ſoil, though not ſo fit for grain, produces excellent paſture for ſheep; ſo that of the four hundred thouſand that are computed to be kept in the county, the greater part are fed here. Of theſe ſheep the wool is exceeding fine; and hence it is that this ſhire is ſo eminent for its manufacture of cloth, of which fifty thouſand pieces are ſaid to have been made yearly, before the practice of clandeſtinely exporting Engliſh wool became ſo common. In the vale, or lower part of the county, through which the Severn paſſes, the air and ſoil are very different from thoſe of the Cotteſwold: for the former is much warmer, and the latter richer, yielding the moſt luxuriant paſtures; in conſequence of which, numerous herds of black cattle are kept, and great quantities of that excellent cheeſe, for which it is ſo much celebrated, made in it. The remaining part of the county, called the

Glocester-shire || Glory.

Foreſt of Dean, was formerly almoſt entirely overrun with wood, and extended 20 miles in length, and 10 in breadth. It was then a neſt of robbers, eſpecially towards the Severn; but now it contains many towns and villages, conſiſting chiefly of miners, employed in the coal pits, or in digging for or forging iron ore, with both which the foreſt abounds. Theſe miners have their particular laws, cuſtoms, courts, and judges: and the king, as in all royal foreſts, has a ſwain-mote for the preſervation of the vert and veniſon. This foreſt was anciently, and is ſtill noted for its oaks, which thrive here ſurpriſingly; but as there is a prodigious conſumption of wood in the forges, it is continually dwindling away. A navigable canal is made from Stroud to Framilode, forming a junction between the Severn and Thames. Its chalybeate ſprings are, St Anthony's well, in Abbenhall pariſh; at Barrow and Maredon, in Bodington pariſh; at Aſh-church, near Tewkeſbury; at Dumbleton, near Winchcomb; at Eaſington, near Durſley; and at Cheltenham. Its ancient fortifications, attributed to the Romans, Saxons, or Danes, are Abſton and Wick, and at Dointon, Dixton, Addleſthorp, Knole, Over Upton, Hanham Bodington, and Bourton on the Water.

GLOCHIDON, a genus of plants, belonging to the monœcia claſs. See BOTANY *Index*.

GLOGAW, a ſtrong town of Germany, in Sileſia, and capital of a duchy of the ſame name. It is not very large, but is well fortified on the ſide of Poland. It has a handſome caſtle, with a tower, in which ſeveral counſellors were condemned by Duke John, in 1498, to periſh with hunger. Beſides the Papiſts, there are a great number of Proteſtants and Jews. It was taken by aſſault, by the king of Pruſſia, in 1741, and the garriſon made priſoners. After the peace in 1742, the king of Pruſſia ſettled the ſupreme court of juſtice here, it being, next to Breſlaw, the moſt populous place in Sileſia. It is ſeated on the river Oder, in E. Long. 16. 15. N. Lat. 51. 39.

GLOGAW *the* LESS, a town of Sileſia, in the duchy of Oppeln, now in the poſſeſſion of the king of Pruſſia. It is 19 miles ſouth of Oppeln, and 45 north-weſt of Breſlaw. E. Long. 16. 15. N. Lat. 51. 38.

GLORIA PATRI, among eccleſiaſtical writers. See DOXOLOGY.

GLORIOSA, SUPERB LILY, a genus of plants, belonging to the hexandria claſs, and in the natural method ranking under the 11th order, *Sarmentoſæ*. See BOTANY *Index*.

GLORY, renown or celebrity. The love of renown, or deſire of fame and reputation, appears to be one of the principal ſprings of action in human ſociety. Glory, therefore, is not to be contemned, as ſome of the ancient philoſophers affected to teach: but it imports us to regulate our purſuit after it by the dictates of reaſon; and if the public approbation will not follow us in that courſe, we muſt leave her behind.—We ought to have our judgments well inſtructed as to what actions are truly glorious; and to remember, that in every important enterpriſe, as Seneca obſerves, *Rectè facti feciſſe merces eſt; officii fructus, ipſum officium eſt*: "The reward of a thing well done, is to have done it; the fruit of a good office, is the office itſelf." Thoſe who by other methods ſcatter their names into many mouths, ſhow they rather hunt after a great reputation than a good one, and their reward is oftener infamy than fame. Glory.

Men generally, and almoſt inſtinctively, affix glory only to ſuch actions as have been produced by an innate deſire for public good; and we meaſure it by that degree of influence which any thing done has upon the common happineſs.

If the actions of the hero conduct ſooneſt to glory and with the greateſt ſplendour, and if the victorious general is ſo great after a ſignal engagement; it is becauſe the ſervice he has done is for the moment, and for all; and becauſe we think without reflecting, that he has ſaved our habitations, our wealth, and our children, and every thing that attaches us to life. If the man of ſcience, who in his ſtudy has diſcovered and calculated the motions of the heavenly bodies, who in his alembics has unveiled ſome of the ſecrets of nature, or who has exhibited to mankind a new art, riſes to fame with leſs noiſe; it is becauſe the utility which he procures is more widely diffuſed, and is often of leſs ſervice to the preſent than to ſucceeding generations.

The conſequences, therefore, of theſe two advantages are as oppoſite as the cauſes are different; and while the benefits procured by the warrior appear to have no more influence, and while his glory becomes obſcure, that of a celebrated writer or inventor ſtill increaſes, and is more and more enlarged. His works every day bring back his name to that age which uſes them, and thus ſtill add to his celebrity and fame.

This poſthumous fame indeed has been decried by ſome writers. In particular, the author of the *Religion of Nature delineated* has treated it as highly irrational and abſurd. "In reality (ſays he) the man is not known ever the more to poſterity, becauſe his name i tranſmitted to them: He doth not live, becauſe his name does. When it is ſaid Julius Cæſar ſubdued Gaul, conquered Pompey, &c. it is the ſame thing as to ſay, the conqueror of Pompey was Julius Cæſar; i. e. Cæſar and the conqueror of Pompey is the ſame thing; Cæſar is as much known by one deſignation as by the other. The amount then is only this, that the conqueror of Pompey conquered Pompey; or ſomebody conquered Pompey; or rather, ſince Pompey is as little known now as Cæſar, ſomebody conquered ſomebody. Such a poor buſineſs is this boaſted immortality! and ſuch is the thing called glory among us! To diſcerning men this fame is mere air, and what they deſpiſe if not ſhun."

But ſurely it were to conſider too curiouſly (as Horatio ſays to Hamlet) to conſider thus. For (as the elegant author of Fitzoſborne's Letters obſerves) although fame with poſterity ſhould be, in the ſtrict analyſis of it, no other than what is here deſcribed, a mere unintereſting propoſition, amounting to nothing more than that ſomebody acted meritoriouſly; yet it would not neceſſarily follow, that true philoſophy would baniſh the deſire of it from the human breaſt: for this paſſion may be (as moſt certainly it is) wiſely implanted in our ſpecies, notwithſtanding the correſponding object ſhould in reality be very different from what it appears in imagination. Do not many of our moſt refined and even contemplative pleaſures owe their exiſtence to our miſtakes? It is but extending ſome of our ſenſes

to

Glory || Gloſſopetra.

to a higher degree of acuteneſs than we now poſſeſs them, to make the faireſt views of nature, or the nobleſt productions of art, appear horrid and deformed. To ſee things as they truly and in themſelves are, would not always, perhaps, be of advantage to us in the intellectual world, any more than in the natural. But, after all, who ſhall certainly aſſure us, that the pleaſure of virtuous fame dies with its poſſeſſor, and reaches not to a farther ſcene of exiſtence? There is nothing, it ſhould ſeem, either abſurd or unphiloſophical in ſuppoſing it poſſible at leaſt, that the praiſes of the good and the judicious, the ſweeteſt muſic to an honeſt ear in this world, may be echoed back to the manſions of the next; that the poet's deſcription of Fame may be literally true, and though ſhe walks upon earth, ſhe may yet lift her head into heaven.

To be convinced of the great advantage of cheriſhing this high regard to poſterity, this noble deſire of an after life in the breath of others, one need only look back upon the hiſtory of the ancient Greeks and Romans. For what other principle was it which produced that exalted ſtrain of virtue in thoſe days, that may well ſerve, in too many reſpects, as a model to theſe? Was it not the *conſentiens laus bonorum*, the *incorrupta vox benè judicantium* (as Tully calls it), "the concurrent approbation of the good, the uncorrupted applauſe of the wiſe," that animated their moſt generous purſuits?

In ſhort, can it be reaſonable to extinguiſh a paſſion which nature has univerſally lighted up in the human breaſt, and which we conſtantly find to burn with moſt ſtrength and brightneſs in the nobleſt and beſt formed boſoms? Accordingly revelation is ſo far from endeavouring to eradicate the ſeed which nature has thus deeply planted, that ſhe rather ſeems, on the contrary, to cheriſh and forward its growth. To be *exalted with honour*, and to be *had in everlaſting remembrance*, are in the number of thoſe encouragements which the Jewiſh diſpenſation offered to the virtuous; and the perſon from whom the ſacred Author of the Chriſtian ſyſtem received his birth, is herſelf repreſented as rejoicing that *all generations ſhould call her bleſſed.*

GLOSS, a comment on the text of any author, to explain his ſenſe more fully and at large, whether in the ſame language or any other. See the article COMMENTARY.—The word, according to ſome, comes from the Greek γλωσσα, "tongue;" the office of a gloſs being to explain the text, as that of the tongue is to diſcover the mind.

GLOSS is likewiſe uſed for a literal tranſlation, or an interpretation of an author in another language word for word.

GLOSS is alſo uſed in matters of commerce, &c. for the luſtre of a ſilk, ſtuff, or the like.

GLOSSARY, a ſort of dictionary, explaining the obſcure and antiquated terms in ſome old author; ſuch are Du Cange's Latin and Greek Gloſſaries, Spelman's Gloſſary, and Kennet's Gloſſary at the end of his Parochial Antiquities.

GLOSSOPETRA, or GLOTTOPETRA, in *Natural Hiſtory*, a kind of extraneous foſſil, ſomewhat in form of a ſerpent's tongue; frequently found in the iſland of Malta and other places.

The vulgar notion is, that they are the tongues of ſerpents petrified; and hence their name, which is a compound of γλωσσα, "tongue" and πετρα, "ſtone." Hence alſo their traditionary virtue in curing the bites of ſerpents. The general opinion of naturaliſts is, that they are the teeth of fiſhes, left at hand by the waters of the deluge, and ſince petrified. Gloſſopetra || Glove.

The ſeveral ſizes of the teeth of the ſame ſpecies, and thoſe of the ſeveral different ſpecies of ſharks, afford a vaſt variety of theſe foſſil ſubſtances. Their uſual colours are black, bluiſh, whitiſh, yellowiſh, or brown; and in ſhape they uſually approach to a triangular figure. Some of them are ſimple; others are tricuſpidate, having a ſmall point on each ſide of the large one: many of them are quite ſtraight; but they are frequently found crooked, and bent in all directions; many of them are ſerrated on their edges, and others have them plain; ſome are undulated on their edges, and ſlightly ſerrated on theſe undulations. They differ alſo in ſize as much as in figure; the larger being four or five inches long, and the ſmaller leſs than a quarter of an inch.

They are moſt uſually found with us in the ſtrata of blue clay, though ſometimes alſo in other ſubſtances, and are frequent in the clay pits of Richmond and other places. They are very frequent alſo in Germany, but nowhere ſo plentiful as in the iſland of Malta.

The Germans attribute many virtues to theſe foſſil teeth; they call them cordials, ſudorifics, and alexipharmics: and the people of Malta, where they are extremely plentiful, hang them about their children's necks to promote dentition. They may poſſibly be of as much ſervice this way as an anodyne necklace; and if ſuſpended in ſuch a manner that the child can get them to its mouth, may, by their hardneſs and ſmoothneſs, be of the ſame uſe as a piece of coral.

GLOTTIS, in *Anatomy*, the narrow ſlit at the upper part of the aſpera arteria, which is covered by the epiglottis when we hold our breath and when we ſwallow. The glottis, by its dilatation and contraction, modulates the voice. See ANATOMY, N° 183.

GLOVE, a covering for the hand and wriſt.

Gloves, with reſpect to commerce, are diſtinguiſhed into leathern gloves, ſilk gloves, thread gloves, cotton gloves, worſted gloves, &c. Leathern gloves are made of chamois, kid, lamb, doe, elk, buff, &c. Gloves now pay a duty to the king, which increaſes according to their value.

To throw the glove, was a practice or ceremony very uſual among our forefathers; being the challenge whereby another was defied to ſingle combat. It is ſtill retained at the coronation of our kings; when the king's champion caſts his glove in Weſtminſter hall. See CHAMPION.

Favyn ſuppoſes the cuſtom to have ariſen from the eaſtern nations, who in all their ſales and deliveries of lands, goods, &c. uſed to give the purchaſer their glove by way of livery or inveſtiture. To this effect he quotes Ruth iv. 7. where the Chaldee paraphraſe calls *glove* what the common verſion renders by *ſhoe*. He adds, that the Rabbins interpret by *glove* that paſſage in the cviiith Pſalm, *In Idumeam extendam calceamentum meum*, "Over *Edom* will I caſt out my ſhoe." Accordingly, among us, he who took up the *glove*, declared thereby his acceptance of the challenge; and as a part of the ceremony, continues Favyn, took the *glove* off his own right hand, and caſt it upon the

Glove, Glover.

ground, to be taken up by the challenger. This had the force of a mutual engagement on each ſide, to meet at the time and place which ſhould be appointed by the king, parliament, or judges. The ſame author aſſerts, that the cuſtom which ſtill obtains of bleſſing *gloves* in the coronation of the kings of France, is a remain of the eaſtern practice of giving poſſeſſion with the *glove*, lib. xvi. p. 1017, &c.

Anciently it was prohibited the judges to wear gloves on the bench. And at preſent in the ſtables of moſt princes, it is not ſafe going in without pulling off the gloves.

GLOVER, Richard, the author of Leonidas and ſeveral other eſteemed works, was the ſon of Richard Glover, a Hamburgh merchant in London, and was born in St Martin's lane in the year 1712. He very early ſhowed a ſtrong propenſity to and genius for poetry; and while at ſchool, he wrote, amongſt other pieces, a poem to the memory of Sir Iſaac Newton, prefixed to the view of that incomparable author's philoſophy, publiſhed in 4to, in 1728, by his intimate friend Dr Pemberton. But though poſſeſſed of talents which were calculated to excel in the literary world, he was content to devote his attention to commerce, and at a proper period commenced a Hamburgh merchant. He ſtill, however, cultivated literature, and aſſociated with thoſe who were eminent in ſcience. One of his earlieſt friends was Matthew Green, the ingenious but obſcure author of ſome admirable poems, which in 1737, after his death, were collected and publiſhed by Mr Glover. In 1737, Mr Glover married Miſs Nunn, with whom he received a handſome fortune; and in the ſame month publiſhed Leonidas, a poem in 4to, which in this and the next year paſſed through three editions. This poem was inſcribed to Lord Cobham; and on its firſt appearance was received by the world with great approbation, though it has ſince been unaccountably neglected. Lord Lyttleton, in a popular publication called Common Senſe, and in a poem addreſſed to the author, praiſed it in the warmeſt terms; and Dr Pemberton publiſhed, Obſervations on Poetry, eſpecially epic, occaſioned by the late poem upon Leonidas, 1738, 12mo, merely with a view to point out its beauties. In 1739, Mr Glover publiſhed "London, or the Progreſs of Commerce," 4to; and a ballad entitled, Hoſier's Ghoſt. Both theſe pieces ſeem to have been written with a view to incite the public to reſent the miſbehaviour of the Spaniards; and the latter had a very conſiderable effect. The political diſſenſions at this period raged with great violence, and more eſpecially in the metropolis; and at different meetings of the livery on thoſe occaſions, Mr Glover was always called to the chair, and acquitted himſelf in a very able manner, his conduct being patriotic and his ſpeeches maſterly. His talents for public ſpeaking, his knowledge of political affairs, and his information concerning trade and commerce, ſoon afterwards pointed him out to the merchants of London as a proper perſon to conduct their application to parliament on the ſubject of the neglect of their trade. He accepted the office; and in ſumming up the evidence gave very ſtriking proofs of his oratorical powers. This ſpeech was pronounced Jan. 27. 1742.

In the year 1744 died the ducheſs of Marlborough, and by her will left to Mr Glover and Mr Mallet 500l. each, to write the Hiſtory of the Duke of Marlborough's Life. This bequeſt, however, never took place. It is ſuppoſed that Mr Glover very early renounced his ſhare of it; and Mallet, though he continued to talk of performing the taſk almoſt as long as he lived, is now known never to have made the leaſt progreſs in it. About this period Mr Glover withdrew a good deal from public notice, and lived in retirement. He had been unſucceſsful in his buſineſs; and with a very laudable delicacy had preferred an obſcure retreat to popular obſervation, until his affairs ſhould put on a more proſperous appearance. He had been honoured with the attention of Frederick prince of Wales, who once preſented him with a complete ſet of the claſſics, elegantly bound; and, on his abſenting himſelf for ſome time on account of the embarraſſment in his circumſtances, ſent him, it is ſaid, 500l. The prince died in March 1751; and in May following Mr Glover was once more drawn from his retreat by the importunity of his friends, and ſtood candidate for the place of chamberlain of London. It unfortunately happened that he did not declare himſelf until moſt of the livery had engaged their votes; by which means he loſt his election. Glover.

In 1753, Mr Glover produced at Drury Lane his tragedy of Boadicea; which was acted nine nights, in the month of December. It had the advantage of the performance of Mr Garrick, Mr Moſſop, Mrs Cibber, and Mrs Pritchard. From the prologue it ſeems to have been patronized by the author's friends in the city; and Dr Pemberton wrote a pamphlet to recommend it.—In 1761, Mr Glover publiſhed Medea, a tragedy written on the Greek model; but it was not acted until 1767, when it appeared for the firſt time on the ſtage at Drury Lane for Mrs Yates's benefit. At the acceſſion of his preſent majeſty, he appears to have ſurmounted the difficulties of his ſituation. In the parliament which was then called, he was choſen member for Weymouth, and continued to ſit as ſuch until the diſſolution of it. He, about this time, intereſted himſelf about India affairs, at one of Mr Sullivan's elections; and in a ſpeech introduced the fable of the man, horſe, and bear; and drew this concluſion, that, whenever merchants made uſe of armed forces to maintain their trade, it would end in their deſtruction.

In 1770, the poem of Leonidas requiring a new edition, it was republiſhed in two volumes 12mo, corrected throughout, and extended from nine books to twelve. It had alſo ſeveral new characters added, beſides placing the old ones in new ſituations. The improvements made in it were very conſiderable; but we believe the public curioſity, at this period, was not ſufficiently alive to recompenſe the pains beſtowed on this once popular performance. The calamities ariſing from the wounds given to public credit, in June 1772, by the failure of the bank of Douglas, Heron, and Co. in Scotland, occaſioned Mr Glover's taking a very active part in the ſettling thoſe complicated concerns, and in ſtopping the diſtreſs then ſo univerſally felt. In February 1774, he called the annuitants of that banking-houſe together, at the King's Arms tavern, and laid propoſals before them for the ſecurity of their demands, with which they were fully ſatisfied. He alſo undertook to manage the intereſts of the merchants and traders of London concerned in the trade to Germany

Glover || Glue.

many and Holland, and of the dealers in foreign linens, in their application to parliament in May 1774. Both the ſpeeches made on theſe occaſions were publiſhed in a pamphlet in that year. In the ſucceeding year he engaged on behalf of the Weſt India merchants in their application to parliament, and examined the witneſſes and ſummed up the evidence in the ſame maſterly manner he had done on former occaſions. For the aſſiſtance he afforded the merchants in this buſineſs, he was complimented by them with a ſervice of plate, of the value of 300l. The ſpeech which he delivered in the houſe was in the ſame year printed. This, we believe, was the laſt opportunity he had of diſplaying his oratorical talents in public. Having now arrived at a period of life which demanded a receſs from buſineſs, Mr Glover retired to eaſe and independence, and ſpent the remainder of his days with dignity and with honour. It is probable that he ſtill continued his attention to his muſe, as we are informed that, beſides an epic poem of conſiderable length, he has left ſome tragedies and comedies behind him in manuſcript. After experiencing for ſome time the infirmities of age, he departed this life 25th November 1785; leaving behind him a moſt eſtimable character as a man, a citizen, and a writer.

GLOW-WORM. See LAMPYRIS, ENTOMOLOGY *Index*.

GLUCINA, in *Chemiſtry*, an earthy ſubſtance which was diſcovered by Vauquelin in 1798, in analyzing the emerald of which it forms a component part. For an account of its properties and combinations, ſee CHEMISTRY, N° 1165.

GLUCKSTADT, a ſtrong and conſiderable town of Germany, in the circle of Upper Saxony, and duchy of Holſtein, with a ſtrong caſtle, and ſubject to Denmark. It is ſeated on the river Elbe, near its mouth, and 28 miles from Hamburgh. E. Long. 9. 20. N. Lat. 53. 31.

GLUE, among artificers, a tenacious viſcid matter, which ſerves as a cement to bind or connect things together.

Glues are of different kinds, according to the various uſes they are deſigned for, as the common glue, glove glue, and parchment glue; whereof the two laſt are more properly called *ſize*.

Hamel du Monceau has written one of the beſt works on the ſubject of glue. According to this author, glue was at firſt principally prepared from the membranous, tendinous, and cartilaginous parts of animals, and after being dried, they were melted into tablets. It is certain, however, that every animal ſubſtance containing jelly, may be uſed in the manufacture of glue; and, according to Du Hamel himſelf, a ſtrong, but black-coloured glue may be obtained from bones and hartſhorn, after they are diſſolved in Papin's digeſter. Of the truth of this fact Papin himſelf likewiſe aſſures us, for he prepared a jelly from bones, and even from ivory, by which he glued together ſome pieces of broken glaſs; and ſubſequent experiments made by other chemiſts have confirmed his aſſertion.

To the information contained on this ſubject in the works of Papin, Spielman has added many valuable remarks. He not only extracted glue from bones, but alſo from all the ſolid parts of animals, by boiling alone, as well as from the teeth of the ſea horſe, the wild boar, the wood-louſe, and the viper.

Glue.

The glue manufactured in Europe is of different kinds; but that which is made in England is eſteemed the beſt. Its colour is of a browniſh red. The Flanders glue is conſidered as of an inferior quality to that made in England, while the glue manufactured in France is not ſo good as either. The reaſon aſſigned for this difference of quality is, that bones and ſinews are made uſe of by the Flemiſh and French in the manufacture of this article, while the Engliſh employ ſkins, which yield a much ſtronger glue. Dr Lewis informs us that the Engliſh ſteep and waſh the cuttings of the hides in water, then boil them in freſh water till the liquor becomes of a proper conſiſtence; after which they ſtrain it through baſkets, allow it to ſettle, then expoſe it to further evaporation, and pour it into flat moulds, where it unites. When thoroughly cooled, it is converted into ſolid cakes, which are cut into pieces, and dried on a kind of net.

Grenet for many years turned his attention to the manufacturing of glue. Having made a number of experiments on every ſubſtance formerly employed for this purpoſe, he found that bones afford the moſt abundant quantity of glue, and yield it with facility. Having deprived them of the fat they contain, he procured a jelly by ſimply boiling them, which, when dried, and thus changed into glue, he found ſuperior to that which was prepared in France, and nearly equal to the beſt glue of commerce.

From the experiments of Parmentier, it appears that ſix pounds of button-makers raſpings yielded a pound of excellent glue, not inferior to that which is manufactured in England. The glue which he obtained from the filings of ivory was equally as good, but more highly coloured. The filings of horn yielded none of this ſubſtance.

To obtain glue as colourleſs as poſſible, a very ſmall quantity of water ſhould be employed for extracting the jelly, by which means it may be concentrated without long evaporation, as expoſure to heat has always a greater or leſs influence on the colour in proportion to the time. The whiteneſs and tranſparency of the Flanders glue are ſaid to originate from an adherence to this plan.

In their conſiſtence, colour, taſte, ſmell, and ſolubility, glues are found to differ from each other. Some glues will diſſolve by agitation in cold water, while others are only ſoluble at the point of ebullition. It is generally admitted that the beſt glue is tranſparent, of a browniſh yellow colour, and having neither taſte nor ſmell. It is perfectly ſoluble in water, forming a viſcous fluid, which, when dry, preſerves its tenacity and tranſparency in every part, and has more ſolidity, colour, and viſcidity, in proportion to the age and ſtrength of the animal from which it is produced.

For the following account of the manufacture of glue, we are indebted to Mr John Clennel of Newcaſtle. "The improvement (he obſerves) of any manufacture depends upon its eaſy acceſs to men of ſcience, and a prudential theoriſt can never be better employed than in attempting to reduce to regularity or to ſyſtem the manufactures that may fall under his attention. In conformity to the firſt principle, I made ſome notes whilſt viſiting a glue manufactory a few years ago in Southwark, and thoſe, interwoven with the remarks on that ſubject of ſome chemiſts of the firſt reſpectability, I take the liberty of ſending

Glue. ſending you: at the ſame time I muſt beg of you, or your correſpondents, that where it may be corrected in any manner, it may be done, and I ſhall feel myſelf obliged by the attention.

"Glue is an inſpiſſated jelly, made of the parings of hides or horns of any kind, the pelts obtained from furriers, and the hoofs and ears of horſes, oxen, calves, ſheep, &c. quantities of all which are imported in addition to the home ſupply, by many of the great manufacturers of this article: theſe are firſt digeſted in lime water, to cleanſe them as far as it can from the greaſe or dirt they may have contracted; they are then ſteeped in clean water, taking care to ſtir them well from time to time; afterwards they are laid in a heap, and the ſuperabundant water preſſed out; then they are boiled in a large braſs caldron with clean water, ſkimming off the dirt as it riſes, and further cleanſed by putting in, after the whole is diſſolved, a little melted alum or lime finely powdered, which, by their deterſive properties, ſtill further purge it: the ſkimming is continued for ſome time, when the maſs is ſtrained through baſkets, and ſuffered to ſettle, that the remaining impurities, if any, may ſubſide; it is then poured gently into the kettle again, and further evaporated by boiling a ſecond time, and ſkimming, until it becomes of a clear but darkiſh brown colour: when it is thought to be ſtrong enough (which is known either by the length of time a certain quantity of water and materials have boiled, or by its appearance during ebullition), it is poured into frames or moulds of about ſix feet long, one broad, and two deep, where it hardens gradually as the heat decreaſes: out of theſe troughs or receivers it is cut, when cold, by a ſpade, into ſquare pieces or cakes, and each of theſe placed within a ſort of wooden box, open in three diviſions to the back; in this the glue, as yet ſoft, is taken to a table by women, where they divide it into three pieces (A) with an inſtrument not unlike a bow, having a braſs wire for its ſtring; with this they ſtand behind the box and cut by its openings, from front to back: the pieces thus cut are taken out into the open air, and dried on a kind of coarſe net work, faſtened in moveable ſheds of about four feet ſquare, which are faſtened in rows in the glue-maker's field (every one of which contains four or five rows of net work); when perfectly dry and hard, it is fit for ſale.

"That is thought the beſt glue which ſwells conſiderably without melting, by three or four days immerſion in cold water, and recovers its former dimenſions and properties by drying. Glue that has got froſt, or that looks thick and black, may be melted over again and refined, with a ſufficient quantity added of freſh to overcome any injury it may have ſuſtained; but it is generally put into the kettle after what is in it has been purged in the ſecond boiling. To know good from bad glue, it is neceſſary for the purchaſer to hold it between his eye and the light, and if it appears of a ſtrong dark brown colour, and free from cloudy or black ſpots, the article is good."

A glue that is colourleſs and of ſuperior quality, is obtained from the ſkins of eels, and known by the name of *ſize*. It is even procured from vellum, parchment, and ſome of the white ſpecies of leather; but for common purpoſes this is by far too expenſive, and is only made uſe of in thoſe caſes of delicate workmanſhip where glue would be too groſs. The ſkins of the rabbit, hare, and cat, are made uſe of in the manufacturing of ſize, by thoſe who are employed in gilding gold, poliſhing, and painting, in various colours. Glue.

From the experiments of Mr Hatchett it appears, that membrane yields different quantities of gelatine, the ſolutions of which evaporated to dryneſs, afforded him an opportunity of obſerving the different degrees of viſcidity and tenacity of mucilage, ſize, and glue. He alſo found that the more viſcid glues are obtained with greater difficulty than ſuch as are leſs ſo. When a cake of glue has been ſteeped three or four days in cold water, it is conſidered of the beſt quality, if it ſwell much without being diſſolved, and if, when taken out, it recovers its original figure and hardneſs by drying.

On comparing the ſkins of different animals, Mr Hatchett found, that ſuch as were moſt flexible more readily yielded their gelatine, and that produced from the ſkin of the rhinoceros was by far the moſt viſcid of any. The true ſkin of any animal was moſt affected by long boiling; but the hide of the rhinoceros was the moſt inſoluble.

He found that hair was not ſo much affected as ſkin; but the cartilages of the joints, when boiled long in water, were as perfectly ſoluble as the cutis, which is not the caſe with the other cartilages, as they afford little or no gelatine. The horns of the ox, ram, and goat, are very different from thoſe of the ſtag; and the ſmall quantity of gelatine they are found to contain, is produced more gradually, and with greater difficulty.

According to Hatchett, the effects of diluted nitric acid on the ſubſtances commonly employed in the manufacturing of glue, were exactly analogous to thoſe of boiling water, and were always moſt powerful on thoſe ſubſtances which contained the greateſt quantity of gelatine. Almoſt all animal ſubſtances are convertible either into glue or ſoap, with this additional advantage, that thoſe parts of them which would not be employed in making the one, are the moſt proper in the manufacture of the other.

Another fine ſpecies of glue, known by the name of *iſinglaſs*, is the produce of certain fiſh, very common in the Ruſſian ſeas, found on entering the rivers Wolga, Lyak, Don, and Danube. In Muſcovy it is prepared of the *ſturgeon* and the *ſtorled*, which yield the moſt beautiful iſinglaſs. The fiſh from freſh water are eſteemed the beſt, as they afford an iſinglaſs more flexible and tranſparent than any other.

When the bladder is extracted, it is waſhed in water to free it from the blood, if any adheres to it, but not otherwiſe. It is then cut longitudinally, and the outer membrane taken off, the colour of which is brown, while the other membrane is ſo fine and white as to be with

(A) When the women, by miſtake, cut only two, that which is double the ſize is called a *biſhop*, and thrown into the kettle again.

Glue || Gluttony.

with difficulty ſeparated from the fiſh. They are formed into rolls of the ſize of the finger, with the fine membrane in the middle, and hung in the air to dry by degrees. Good iſinglaſs is white, perfectly dry, ſemitranſparent, and without ſmell. It is ſoluble in water with a gentle heat, but is eaſily diſſolved in alcohol, in which it differs eſſentially from common glue. That which is made from different parts of ſea wolves, ſea cows, ſharks, and whales, is employed in the clarifying of different wines and other liquors. Iſinglaſs is of all ſhades of colour, from pure tranſparency to black; but ſuch as are large and yellow are reckoned the worſt. They are opaque, and their ſmell is diſagreeable.

From 500 grains of iſinglaſs Mr Hatchett obtained 56 grains of coal, from which 1½ grain of earthy reſiduum were obtained by reducing it to aſhes. Of conſequence there were only 54.5 grains of pure coal, and the remaining 1.5 he found to be phoſphate of ſoda, with an extremely ſmall proportion of phoſphate of lime.

GLUME (*gluma*), among botaniſts, a ſpecies of calyx, conſiſting of two or three membranous valves, which are often pellucid at the edges. This kind of calyx belongs to the graſſes.

GLUT, among falconers, the ſlimy ſubſtance that lies in a hawk's paunch.

GLUTA, a genus of plants belonging to the gynandria claſs. See BOTANY *Index*.

GLUTÆUS, a name common to three muſcles whoſe office it is to extend the thigh. See ANATOMY, *Table of the Muſcles*.

GLUTTON. See MUSTELA, MAMMALIA *Index*.

GLUTTONY, a voracity of appetite, or a propenſity to gormandizing.

There is a morbid ſort of gluttony, called *fames canina*, "dog-like appetite," which ſometimes occurs, and renders the perſon ſeized with it an object of pity and of cure as in other diſeaſes: (ſee BULIMY).—But profeſſed habitual gluttons may be reckoned amongſt the monſters of nature, and deemed in a manner puniſhable for endeavouring to bring a dearth or famine into the places where they live. For which reaſon, people think King James I. was in the right, when a man being preſented to him who could eat a whole ſheep at one meal, he aſked "What he could do more than another man?" and being anſwered "He could not do ſo much, ſaid "Hang him then; for it is unfit a man ſhould live that eats ſo much as 20 men, and cannot do ſo much as one."

The emperor Clodius Albinus would devour more apples at once than a buſhel would hold. He would eat 500 figs to his breakfaſt, 100 peaches, 10 melons, 20 pound weight of grapes, 100 gnat-ſnappers, and 400 oyſters. "Fye upon him (ſaith Lipſius); God keep ſuch a curſe from the earth."

One of our Daniſh kings named *Hardiknute* was ſo great a glutton, that a hiſtorian calls him *Bacca de Porco*, "Swine's mouth." His tables were covered four times a-day with the moſt coſtly viands that either the air, ſea, or land, could furniſh; and as he lived he died; for, revelling and carouſing at a wedding banquet at Lambeth, he fell down dead. His death was ſo welcome to his ſubjects, that they celebrated the day with ſports and paſtimes, calling it *Hock tide*, which ſignifies ſcorn and contempt. With this king ended the reign of the Danes in England. Gluttony || Gmelin.

One Phagon, under the reign of the emperor Aurelianus, at one meal, ate a whole boar, 100 loaves of bread, a ſheep, a pig, and drank above three gallons of wine.

We are told by Fuller*, that one Nicholas Wood, of Harriſon in Kent, ate a whole ſheep of 16s. price at one meal, raw; at another time 30 dozen of pigeons. At Sir William Sidley's in the ſame county, he ate as much victuals as would have ſufficed 30 men. At Lord Wotton's manſion houſe in Kent, he devoured at one dinner 84 rabbits; which, by computation, at half a rabbit a man, would have ſerved 168 men. He ate to his breakfaſt 18 yards of black pudding. He devoured a whole hog at one ſitting down; and after it, being accommodated with fruit, he ate three pecks of damoſins.

* *Worthies*, p. 86.

A counſellor at law, whoſe name was Mallet, well known in the reign of Charles I. ate at one time an ordinary provided in Weſtminſter for 30 men at 12d. a-piece. His practice not being ſufficient to ſupply him with better ſort of meat, he fed generally on offals, ox livers, hearts, &c. He lived to almoſt 60 years of age, and for the ſeven laſt years of his life ate as moderately as other men. A narrative of his life was publiſhed.

GLYCINE, KNOBBED-ROOTED LIQUORICE-VETCH; a genus of plants belonging to the diadelphia claſs; and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY *Index*.

GLYCIRRHIZA, LIQUORICE; a genus of plants belonging to the diadelphia claſs; and in the natural method ranking under the 32d order, *Papilionaceæ*. See BOTANY and MATERIA MEDICA *Index*.

GLYNN, a county in the lower diſtrict of Georgia, in America, bounded on the eaſt by the ocean, on the north by the river Alatamaha, by which it is ſeparated from Liberty county, and on the ſouth by Camden. It contains 413 people, of which 215 are ſlaves. The chief town is Brunſwick.

GLYPH, in *Sculpture* and *Architecture*, denotes any canal or cavity uſed as an ornament.

GMELIN, JOHN GEORGE, M. D. public lecturer on botany and phyſic at Tubingen, member of the Royal Society of Gottingen, and of the Academy of Sciences at Stockholm, was born on the 12th of Auguſt 1709, at Tubingen, where his father was an apothecary. Such was his diligence while at ſchool, that he was qualified to attend the academical lectures at the age of 14, and was created doctor of medicine when only 19. He paid a viſit about this time to the metropolis of the Ruſſian empire, that he might have the pleaſure of ſeeing ſome of his former teachers. There he became acquainted with Blumentroſt, director of the academy, who introduced him to the meetings of the members, and procured for him an annual penſion. At Peterſburgh he was ſo much eſteemed, that when he intimated a wiſh in 1729 to return to Tubingen, he was honoured with a place among the regular members of the academy, and choſen profeſſor of chemiſtry and natural hiſtory in the year 1731. In order to carry into execution a plan which had been formed by Peter the Great, for exploring a paſſage to China and Japan along the coaſt of the Ruſſian empire,

Gmelin

Gmelin. Gmelin was ſelected along with two others, as properly qualified for that undertaking, and likewiſe to aſcertain the boundaries of Siberia. The department of natural hiſtory was aſſigned to our author. He had with him and his companions, ſix ſtudents, two draftſmen, two hunters, two miners, four land-ſurveyors, and 12 ſoldiers, with a ſerjeant and drummer. They began their journey on the 19th of Auguſt 1733; and in 1736, Steller and a painter joined their ſociety, in order to aſſiſt Gmelin in his arduous labours.

By exploring Kamtſchatka, they hoped to accompliſh their miſſion in a ſatisfactory manner, for which purpoſe Steller proceeded to this place, and the reſt of the ſociety continued their travels through Siberia. In February 1743 Gmelin returned to Peterſburgh in ſafety after a dangerous journey which laſted nine years and a half, but proved of the utmoſt importance to various branches of ſcience. He reſumed the offices which he had filled before; and having paid a viſit in 1747 to his native country, he was choſen profeſſor, while abſent, in the room of Bachmeiſter deceaſed. He was ſeized with a violent fever in May 1755, which put a period to his valuable life, in the 45th year of his age. He was undoubtedly one of the moſt eminent botaniſts of the laſt century, and has rendered his name immortal by his *Flora Sibirica, ſeu hiſtoria plantarum Siberiæ*, in four parts, large quarto. He determined the boundaries between Europe and Aſia, which every celebrated geographer has adopted ſince his day. Through all his works the traces of great modeſty, a ſacred regard to truth, and the moſt extenſive knowledge of nature, are remarkably conſpicuous.

GMELIN, *Dr Samuel*, was born in 1743 at Tubingen, where he alſo ſtudied, and became doctor in medicine in 1763. He was afterwards admitted a member of the Imperial Academy of Sciences at St Peterſburg. He commenced his travels in June 1768; and having traverſed the provinces of Moſcow, Voronetz, New Ruſſia, Azof, Caſan, and Aſtracan, he viſited, in 1770 and 1771, the different harbours of the Caſpian, and examined with peculiar attention thoſe parts of the Perſian provinces which border upon that ſea, of which he has given a circumſtantial account in the three volumes of his travels already publiſhed. Actuated by a zeal for extending his obſervations, he attempted to paſs through the weſtern provinces of Perſia, which are in a perpetual ſtate of warfare, and infeſted by numerous banditti. Upon this expedition, he quitted, in April 1772, Einzillee, a ſmall trading place in Ghilan, upon the ſouthern ſhore of the Caſpian; and, on account of many difficulties and dangers, did not, until December 2. 1773, reach Sallian, a town ſituated upon the mouth of the river Koor. Thence he proceeded to Baku and Kuba, in the province of Shirvan, where he met with a friendly reception from Ali Feth Khan, the ſovereign of that diſtrict. After he had been joined by 20 Uralian Coſſacks, and when he was only four days journey from the Ruſſian fortreſs Kiſlar, he and his companions were, on the 5th of February 1774, arreſted by order of Uſméi Khan, a petty Tartar prince, through whoſe territories he was obliged to paſs. Uſméi urged as a pretence for this arreſt, that 30 years ago ſeveral families had eſcaped from his dominions, and had found an aſylum in the Ruſſian territories; adding, that Gmelin ſhould not be releaſed until theſe families were reſtored. The profeſſor was removed from priſon to priſon; and at length, wearied out with continued perſecutions, he expired, July 27th, at Achmet-Kent, a village of Mount Caucaſus. His death was occaſioned partly by vexation for the loſs of ſeveral papers and collections, and partly by diſorders contracted from the fatigues of his long journey. Some of his papers had been ſent to Kiſlar during his impriſonment, and the others were not without great difficulty reſcued from the hands of the barbarian who had detained him in captivity. The arrangement of theſe papers, which will form a fourth volume of his travels, was at firſt conſigned to the care of Guildenſtaedt, but upon his death has been transferred to the learned Pallas. Gmelin || Gnoſtics.

GMELINA, a genus of plants belonging to the didynamia claſs; and in the natural method ranking under the 40th order, *Perſonatæ*. See BOTANY *Index*.

GNAPHALIUM, CUD-WEED, GOLDY-LOCKS, ETERNAL FLOWER, &c.; a genus of plants belonging to the ſyngeneſia claſs; and in the natural method ranking under the 49th order, *Compoſitæ*. See BOTANY *Index*.

GNAT. See CULEX, ENTOMOLOGY *Index*.

GNESNA, a large and ſtrong town of Great Poland, of which it is capital, and in the palatinate of Caliſh, with an archbiſhop's ſee, whoſe prelate is primate of Poland, and viceroy during the vacancy of the throne. It was the firſt town built in the kingdom, and formerly more conſiderable than at preſent. E. Long. 17. 42. N. Lat. 52. 26.

GNETUM, a genus of plants belonging to the monœcia claſs. See BOTANY *Index*.

GNIDIA, a genus of plants belonging to the octandria claſs. See BOTANY *Index*.

GNOMES, GNOMI, certain imaginary beings, who, according to the cabbaliſts, inhabit the inner parts of the earth. They are ſuppoſed ſmall in ſtature, and the guardians of quarries, mines, &c. See FAIRY.

GNOMON, in *Dialling*, the ſtyle, pin, or cock of a dial, which by its ſhadow ſhows the hour of the day. The gnomon of every dial repreſents the axis of the earth: (See DIAL and DIALLING).—The word is Greek, γνωμων, which literally implies ſomething that makes a thing known; by reaſon that the ſtyle or pin indicates or makes the hour known.

GNOMON, in *Aſtronomy*, a ſtyle erected perpendicular to the horizon, in order to find the altitude of the ſun. See ASTRONOMY.

By means of a gnomon, the ſun's meridian altitude, and conſequently the latitude of the place, may be found more exactly than with the ſmaller quadrants. See QUADRANT.

By the ſame inſtrument the height of any object may be found: for as the diſtance of the obſerver's eye from the gnomon, is to the height of the ſtyle; ſo is the diſtance of the obſerver's eye from the object, to its height.

For the uſes and application of gnomons, ſee GEOGRAPHY.

GNOMON of a Globe; the index of the hour circle.

GNOMONICS, the art of dialling. See DIALLING.

GNOSTICS, ancient heretics, famous from the firſt riſe of Chriſtianity, principally in the eaſt.

It

Gnoſtics. It appears from ſeveral paſſages of the ſacred writings, particularly 1 John ii. 18. 1 Tim. vi. 20. and Col. ii. 8. that many perſons were infected with the Gnoſtic hereſy in the firſt century; though the ſect did not render itſelf conſpicuous, either for number or reputation, before the time of Adrian, when ſome writers erroneouſly date its riſe.

The name is formed of the Latin *gnoſticus*, and that of the Greek γνωστικος, "knowing," of γινωσκω, "I know;" and was adopted by thoſe of this ſect, as if they were the only perſons who had the true knowledge of Chriſtianity. Accordingly, they looked on all other Chriſtians as ſimple, ignorant, and barbarous perſons, who explained and interpreted the ſacred writings, in a too low, literal, and unedifying ſignification.

At firſt the Gnoſtics were only the philoſophers and wits of thoſe times, who formed for themſelves a peculiar ſyſtem of theology, agreeable to the philoſophy of Pythagoras and Plato; to which they accommodated all their interpretations of Scripture. But

Gnostics afterwards became a general name, comprehending divers ſects and parties of heretics, who roſe in the firſt centuries, and who, though they differed among themſelves as to circumſtances, yet all agreed in ſome common principles. They were ſuch as corrupted the doctrine of the goſpel by a profane mixture of the tenets of the oriental philoſophy, concerning the origin of evil and the creation of the world, with its divine truths. Such were the Valentinians, Simonians, Carpocratians, Nicolaitans, &c.

Gnostics was ſometimes alſo more particularly attributed to the ſucceſſors of the firſt Nicolaitans and Carpocratians, in the ſecond century, upon their laying aſide the names of the firſt authors. Such as would be thoroughly acquainted with all their doctrines, reveries, and viſions, may conſult St Irenæus, Tertullian, Clemens Alexandrinus, Origen, and St Epiphanius; particularly the firſt of theſe writers, who relates their ſentiments at large: and confutes them at the ſame time: indeed, he dwells more expreſsly on the Valentinians than any other ſort of Gnoſtics; but he ſhows the general principles whereon all their miſtaken opinions were founded, and the method they followed in explaining ſcripture. He accuſes them of introducing into religion certain vain and ridiculous genealogies, i. e. a kind of divine proceſſions or emanations which had no other foundation but in their own wild imaginations.

In effect, the Gnoſtics confeſſed that theſe æons or emanations were nowhere expreſsly delivered in the ſacred writings; but inſiſted at the ſame time, that Jeſus Chriſt had intimated them in parables to ſuch as could underſtand him. They built their theology not only on the goſpels and the epiſtles of St Paul, but alſo on the law of Moſes and the prophets. Theſe laſt laws were peculiarly ſerviceable to them, on account of the allegories and alluſions with which they abound, which are capable of different interpretations: Though their doctrine, concerning the creation of the world by one or more inferior beings of an evil or imperfect nature, led them to deny the divine authority of the books of the Old Teſtament, which contradicted this idle fiction, and filled them with an abhorrence of Moſes and the religion he taught; alleging, that he was actuated by the malignant author of this world, who conſulted his own glory and authority, and not the real advantage of men. Their perſuaſion that evil reſided in matter, as its centre and ſource, made them treat the body with contempt, diſcourage marriage, and reject the doctrine of the reſurrection of the body and its re-union with the immortal ſpirit. Their notion, that malevolent genii preſided in nature, and occaſioned diſeaſes and calamities, wars, and deſolations, induced them to apply themſelves to the ſtudy of magic, in order to weaken the powers or ſuſpend the influence of their malignant agents. Gnoſtics.

The Gnoſtics conſidered Jeſus Chriſt as the Son of God, and conſequently inferior to the Father, who came into the world for the reſcue and happineſs of miſerable mortals, oppreſſed by matter and evil beings; but they rejected our Lord's humanity, on the principle that every thing corporeal is eſſentially and intrinſically evil; and therefore the greateſt part of them denied the reality of his ſufferings. They ſet a great value on the beginning of the goſpel of St John, where they fancied they ſaw a great deal of their æons, or emanations, under the *Word*, the *Life*, the *Light*, &c. They divided all nature into three kinds of beings, viz, *hylic*, or material; *pſychic*, or animal; and *pneumatic*, or ſpiritual. On the like principle they alſo diſtinguiſhed three ſorts of men; *material*, *animal*, and *ſpiritual*. The firſt, who were material and incapable of knowledge, inevitably periſhed, both ſoul and body; the third, ſuch as the Gnoſtics themſelves pretended to be, were all certainly ſaved; the pſychic, or animal, who were the middle between the other two, were capable either of being ſaved or damned, according to their good or evil actions.

With regard to their moral doctrines and conduct, they were much divided. The greateſt part of the ſect adopted very auſtere rules of life, recommended rigorous abſtinence, and preſcribed ſevere bodily mortifications, with a view of purifying and exalting the mind. However, ſome maintained, that there was no moral difference in human actions; and thus confounding right and wrong, they gave a looſe rein to all the paſſions, and aſſerted the innocence of following blindly all their motions, and of living by their tumultuous dictates. They ſupported their opinions and practice by various authorities; ſome referred to fictitious and apocryphal writings of Adam, Abraham, Zoroaſter, Chriſt, and his apoſtles; others boaſted, that they had deduced their ſentiments from ſecret doctrines of Chriſt, concealed from the vulgar; others affirmed, that they arrived at ſuperior degrees of wiſdom by an innate vigour of mind; and others aſſerted, that they were inſtructed in theſe myſterious parts of theological ſcience by Theudas, a diſciple of St Paul, and by Matthias, one of the friends of our Lord. The tenets of the ancient Gnoſtics were revived in Spain, in the fourth century, by a ſect called the *Priſcillianiſts*.

The appellation *Gnoſtic* ſometimes alſo occurs in a good ſenſe, in the ancient eccleſiaſtical writers, and particularly Clemens Alexandrinus, who, in the perſon of his Gnoſtic, deſcribes the characters and qualities of a perfect Chriſtian. This point he labours in the ſeventh book of his Stromata, where he ſhows that none but the Gnoſtic, or learned perſon, has any true religion. He affirms, that were it poſſible for the knowledge

Gnoſtics ‖ Goa.

ledge of God to be ſeparated from eternal ſalvation, the Gnoſtic would make no ſcruple to chooſe the knowledge; and that if God would promiſe him impunity in doing of any thing he has once ſpoken againſt, or offer him heaven on thoſe terms, he would never alter a whit of his meaſures. In this ſenſe the father uſes Gnoſtics, in oppoſition to the heretics of the ſame name; affirming, that the true Gnoſtic is grown old in the ſtudy of the holy ſcriptures; and that he preſerves the orthodox doctrine of the apoſtles and of the church; whereas the falſe Gnoſtic abandons all the apoſtolical traditions, as imagining himſelf wiſer than the apoſtles. At length the name *Gnoſtic*, which originally was the moſt glorious, became infamous, by the idle opinions and diſſolute lives of the perſons who bore it.

GNU, or GNOU. See CAPRA, MAMMALIA *Index*.

GOA, a large and ſtrong town of Aſia, in the peninſula on this ſide the Ganges, and on the Malabar coaſt. It was taken by the Portugueſe in 1508, and is the chief town of all their ſettlements on this ſide the Cape of Good Hope. It ſtands in an iſland of the ſame name, about 12 miles in length, and ſix in breadth; and the city is built on the north ſide of it, having the conveniency of a fine ſalt-water river, capable of receiving ſhips of the greateſt burden, where they lie within a mile of the town. The banks of the river are beautified with a great number of handſome ſtructures; ſuch as churches, caſtles, and gentlemen's houſes. The air within the town is unwholeſome, for which reaſon it is not ſo well inhabited now as it was formerly. The viceroy's palace is a noble building; and ſtands at a ſmall diſtance from the river, over one of the gates of the city, which leads to a ſpacious ſtreet, terminated by a beautiful church. This city contains a great number of handſome churches, convents, and cloiſters, with a ſtately large hoſpital; all well endowed, and kept in good repair. The market place occupies an acre of ground; and in the ſhops about it may be had the produce of Europe, China, Bengal, and other countries of leſs note. Every church has a ſet of bells, ſome of which are continually ringing. There are a great many Indian converts; but they generally retain ſome of their old cuſtoms, particularly they cannot be brought to eat beef. The clergy are very numerous and illiterate; but the churches are finely embelliſhed, and have great numbers of images. In one of theſe churches, dedicated to Bon Jeſus, is the chapel of St Franciſco de Xaviere, whoſe tomb it contains: this chapel is a moſt ſuperb and magnificent place; the tomb of the ſaint is entirely of fine black marble brought from Liſbon; on the four ſides of it the principal actions of the life of the ſaint are moſt elegantly carved in baſſo relievo; theſe repreſent his converting the different nations to the Catholic faith: the figures are done to the life, and moſt admirably executed: it extends to the top in a pyramidical form, which terminates with a coronet of mother-of-pearl. On the ſides of this chapel are excellent paintings, done by Italian maſters; the ſubjects chiefly from Scripture. This tomb and the chapel appertaining to it, muſt have coſt an immenſe ſum of money; the Portugueſe juſtly eſteem it the greateſt rarity in the place. The houſes are large, and make a fine ſhow; but within they are but poorly furniſhed. The inhabitants are contented with greens, fruits, and roots; which, with a little bread, rice, and fiſh, is their principal diet, though they have hogs and fowls in plenty. The river's mouth is defended by ſeveral forts and batteries, well planted with large cannon on both ſides; and there are ſeveral other forts in different places.

Gnoſtics ‖ God.

Goa is the reſidence of a captain general, who lives in great ſplendour. He is alſo commander in chief of all the Portugueſe forces in the Eaſt Indies. They have here two regiments of European infantry, three legions of ſepoys, three troops of native light horſe, and a militia; in all about five thouſand men. Goa is at preſent on the decline, and in little or no eſtimation with the country powers; indeed their bigotry and ſuperſtitious attachment to their faith is ſo general, that the inhabitants, formerly populous, are now reduced to a few thinly inhabited villages; the chief part of whom have been baptized; for they will not ſuffer any Muſſulman or Gentoo to live within the precincts of the city: and theſe few are unable to carry on the huſbandry or manufactures of the country. The court of Portugal is obliged to ſend out annually a very large ſum of money, to defray the current expences of the government; which money is generally ſwallowed up by the convents and ſoldiery.

There was formerly an inquiſition at this place, but it is now aboliſhed; the building ſtill remains, and by its black outſide appears a fit emblem of the cruel and bloody tranſactions that paſſed within its walls! Proviſions are to be had at this place in great plenty and perfection. E. Long. 73. 46. N. Lat. 15. 28.

GOAL. See GAOL.

GOAT. See CAPRA, MAMMALIA *Index*.

GOAT's Beard. See TRAGOPOGON, BOTANY *Index*.

GOAT-Sucker. See CAPRIMULGUS, ORNITHOLOGY *Index*.

GOBELIN, GILES, a celebrated French dyer, in the reign of Francis I. diſcovered a method of dyeing a beautiful ſcarlet, and his name has been given ever ſince to the fineſt French ſcarlets. His houſe, in the ſuburb of St Marcel at Paris, and the river he made uſe of, are ſtill called *the Gobelins*. An academy for drawing, and a manufactory of fine tapeſtries, were erected in this quarter in 1666; for which reaſon the tapeſtries are called *the Gobelins*.

GOBIUS, a genus of fiſhes belonging to the order of thoracici. See ICHTHYOLOGY *Index*.

GOBLET, or GOBELET, a kind of drinking cup, or bowl, ordinarily of a round figure, and without either foot or handle. The word is French, *gobelet*; which Salmaſius, and others, derive from the barbarous Latin *cupa*. Budeus deduces it from the Greek κυπελλον, *a ſort of cup*.

GOD, one of the many names of the Supreme Being. See CHRISTIANITY, METAPHYSICS, MORAL PHILOSOPHY, and THEOLOGY.

GOD is alſo uſed in ſpeaking of the falſe deities of the heathens, many of which were only creatures to which divine honours and worſhip were ſuperſtitiouſly paid.

The Greeks and Latins, it is obſervable, did not mean by the name of *God*, an all-perfect being, whereof eternity, infinity, omnipreſence, &c. were eſſential attributes; with them, the word only implied an excellent and ſuperior nature; and accordingly they gave the

God || Goddard.

the appellation *gods* to all beings of a rank or class higher and more perfect than that of men; and especially to those who were inferior agents in the divine administration, all subject to the one Supreme. Thus men themselves, according to their system, might become gods after death; inasmuch as their souls might attain to a degree of excellence superior to what they were capable of in life.

The first divines, Father Bossu observes, were the poets: the two functions, though now separated, were originally combined; or, rather, were one and the same thing.

Now the great variety of attributes in God, that is, the number of relations, capacities, and circumstances, wherein they had occasion to consider him, put these poets, &c. under a necessity of making a partition, and of separating the divine attributes into several persons; because the weakness of the human mind could not conceive so much power and action in the simplicity of one single divine nature. Thus the omnipotence of God came to be represented under the person and appellation of Jupiter; the wisdom of God, under that of Minerva; the justice of God, under that of Juno.

The first idols or false gods that are said to have been adored, were the stars, sun, moon, &c. on account of the light, heat, and other benefits, which we derive from them. Afterwards the earth came to be deified, for furnishing fruits necessary for the subsistence of men and animals; then fire and water became objects of divine worship, for their usefulness to human life. In process of time, and by degrees, gods became multiplied to infinity: and there was scarce any thing but the weakness or caprice of some devotee or other elevated into the rank of deity; things useless or even destructive not excepted. See MYTHOLOGY.

GODALMING, a town of England, in the county of Surrey, situated on the river Wye, 35 miles from London. Here is a manufactory of mixed and blue kerseys, and of stockings; the place is also famous for liquorice, and store of peat that burns better than pit-coal: in 1739, the smallpox carried off above 500 persons here in three months, which was more than a third of the inhabitants. W. Long. 0. 31. N. Lat. 51. 1.

GODDARD, JONATHAN, an eminent physician and chemist, and one of the first promoters of the Royal Society, was born about the year 1617. He was elected a fellow of the college of physicians in 1646, and appointed reader of the anatomical lecture in that college in 1647. As he took part against Charles I. accepted the wardenship of Merton-college, Oxford, from Oliver Cromwell when chancellor, and sat sole representative of that university in Cromwell's parliament, he was removed from his wardenship in a manner disgraceful to him by Charles II. He was however then professor of physic at Gresham college, to which he retired, and continued to attend those meetings that gave birth to the Royal Society; upon the first establishment of which he was nominated one of the council. Being fully persuaded that the preparation of medicines was no less the physician's duty than the prescribing them, he constantly prepared his own; and in 1668 published a treatise recommending his example to general practice. He died of an apoplectic fit in 1674; and his memory was preserved by the drops that bore his name, otherwise called *Guttæ Anglicanæ*, the secret of which he sold to Charles II. for 5000l. and which Dr Lister assures us was only the volatile spirit of raw silk rectified with oil of cinnamon or some other essential oil. But he claims more particular regard, if what Bishop Seth Ward says be true, that he was the first Englishman who made that noble astronomical instrument, the telescope.

Goddard || Godmanchester.

GODDESS, a heathen deity of the female sex.

The ancients had almost as many goddesses as gods: such were, Juno the goddess of air, Diana the goddess of woods, &c. and under this character were represented the virtues, graces, and principal advantages of life; truth, justice, piety, liberty, fortune, victory, &c.

It was the peculiar privilege of the goddesses to be represented naked on medals; for it was supposed that the imagination must be awed and restrained by the consideration of the divine character.

GODFATHERS and GODMOTHERS, persons who, at the baptism of infants, answer for their future conduct, and solemnly promise that they will renounce the devil and all his works, and follow a life of piety and virtue; and by this means lay themselves under an indispensable obligation to instruct them, and watch over their conduct.

This custom is of great antiquity in the Christian church; and was probably instituted to prevent children being brought up in idolatry, in case their parents died before they arrived at years of discretion.

The number of godfathers and godmothers is reduced to two, in the church of Rome; and three, in the church of England: but formerly they had as many as they pleased.

GODFREY of Bouillon, prince of Lorrain, a most celebrated crusader, and victorious general. He was chosen general of the expedition which the Christians undertook for the recovery of the Holy Land, and sold his dukedom to prepare for the war. He took Jerusalem from the Turks in 1099; but his piety, as historians relate, would not permit him to wear a diadem of gold in the city where his Saviour had been crowned with thorns. The sultan of Egypt afterwards sent a terrible army against him; which he defeated, with the slaughter of about 100,000 of the enemy. He died in 1160.

GODMANCHESTER, a town of Huntingdonshire 16 miles from Cambridge, and 57 from London. It has a bridge on the Ouse, opposite to Huntingdon; was formerly a Roman city, by the name of Durosiponte, where many Roman coins have been often dug up; and according to old writers, in the time of the Saxons it was the see of a bishop, and had a castle built by one Gorman a Danish king, from which the town was called *Gormanchester*. It is a large village, containing 1373 inhabitants in 1801, and is seated in a fertile soil, abounding with corn. It is said that no town in England kept more ploughs at work than this has done. The inhabitants boast they formerly received our kings as they made a progress this way, with nine score ploughs at a time, finely adorned with their trappings, &c. James I. made it a corporation by the name of two bailiffs, 12 assistants, and the commonalty of the borough of Godmanchester. Here is a school, called the Free Grammar-School of Queen Elizabeth. On the west side of the town is a noble though ancient seat

Godmanchester || Gog.

of the earl of Sandwich. Near this place, in the London road between Huntingdon and Caxton, is a tree well known to travellers by the name of Beggar's Buſh.

GODSTOW, a place north-weſt of Oxford, in a ſort of iſland formed by the divided ſtreams of the Iſis after being joined by the Evenlode. It is noted for catching of fiſh and dreſſing them; but more ſo for the ruins of that nunnery which fair Roſamond quitted for the embraces of Henry II. The people ſhow a great hole in the earth here, where they ſay is a ſubterraneous paſſage, which goes under the river to Woodſtock, by which ſhe uſed to paſs and repaſs. Little more remains at preſent than ragged walls, ſcattered over a conſiderable extent of ground. An arched gateway, and another venerable ruin, part of the tower of the conventual church, are ſtill ſtanding. Near the altar in this church fair Roſamond was buried, but the body was afterwards removed by order of a biſhop of Lincoln, the viſitor. The only entire part is ſmall, formerly a private chapel. Not many years ſince a ſtone coffin, ſaid to have been Roſamond's, who, perhaps, was removed from the church to this place, was to be ſeen here. The building has been put to various uſes, and at preſent ſerves occaſionally for a ſtable.

GODWIN, FRANCIS, ſucceſſively biſhop of Llandaff and Hereford, was born in 1567. He was eminent for his learning and abilities; being a good mathematician, an excellent philoſopher, a pure Latiniſt, and an accurate hiſtorian. He underſtood the true theory of the moon's motion a century before it was generally known. He firſt ſtarted thoſe hints afterwards purſued by Biſhop Wilkins, in his "Secret and ſwift meſſenger;" and publiſhed "A catalogue of the lives of Engliſh biſhops." He has nevertheleſs been accuſed as a great ſimoniac, for omitting no opportunity of diſpoſing of preferments in order to provide for his children. He died in 1648.

GODWIN or *Goodwin Sands*. See KENT.

GODWIT. See SCOLOPAX, ORNITHOLOGY *Index*.

GOES, or TER GOES, a ſtrong and conſiderable town of the United Provinces, in Zealand, and capital of the iſland of South Beverland. It communicates with the ſea by a canal; and is 10 miles eaſt of Middleburgh, and 30 north of Ghent. E. Long. 3. 50. N. Lat. 51. 33.

GOG and MAGOG, two names generally joined together in ſcripture, Ezek. xxxviii. 2, 3, &c. xxxix. 1, 2, &c. Rev. xx. 8.). Moſes ſpeaks of Magog the ſon of Japhet, but ſays nothing of Gog, (Gen. x. 2. 1 Chr. i. 5.). Gog was prince of Magog, according to Ezekiel. Magog ſignifies the country or people, and Gog the king of that country. The generality of the ancients made Magog the father of the Scythians and Tartars; and ſeveral interpreters diſcovered many footſteps of their name in the provinces of Great Tartary. Others have been of opinion that the Perſians were the deſcendants of Magog; and ſome have imagined that the Goths were deſcended from Gog and Magog; and that the wars deſcribed by Ezekiel, and undertaken by Gog againſt the ſaints, are no other than thoſe which the Goths carried on in the fifth age againſt the Roman empire.

Bochart has placed Gog in the neighbourhood of Caucaſus. He derives the name of this celebrated mountain from the Hebrew *Gog chaſan* "the fortreſs of Gog." He maintains that Prometheus, ſaid to be chained to Caucaſus by Jupiter, is Gog, and no other. There is a province in Iberia called the *Gogarene*.

Gog || Golconda.

Laſtly, the generality believe, that Gog and Magog, mentioned in Ezekiel and the Revelation, are to be taken in an allegorical ſenſe, for ſuch princes as were enemies to the church and ſaints. Thus many by Gog in Ezekiel underſtand Antiochus Epiphanes, the perſecutor of the Jews who were firm to their religion; and by the perſon of the ſame name in the Revelations, they ſuppoſe Antichriſt to be meant, the great enemy of the church and faithful. Some have endeavoured to prove that Gog, ſpoken of in Ezekiel, and Cambyſes king of Perſia, were one and the ſame perſon; and that Gog and Magog in the Revelation denote all the enemies of the church, who ſhould be perſecutors of it to the conſummation of ages.

GOGGLES, in *Surgery*, are inſtruments uſed for curing ſquinting, or that diſtortion of the eyes which occaſions this diſorder. They are ſhort conical tubes, compoſed of ivory ſtained black, with a thin plate of the ſame ivory fixed in the tubes near their anterior extremities. Through the centre of each of theſe plates is a ſmall circular hole, about the ſize of the pupil of the eye, for the tranſmiſſion of the rays of light. Theſe goggles muſt be continually worn in the daytime, till the muſcles of the eye are brought to act regularly and uniformly, ſo as to direct the pupil ſtraight forwards; and by theſe means the cure will be ſooner or later effected.

GOGMAGOG HILLS, are hills ſo called, three miles from Cambridge, remarkable for the intrenchments and other works caſt up here: whence ſome ſuppoſe it was a Roman camp; and others, that it was the work of the Danes.

GOGUET, ANTONY-YVES, a French writer, and author of a celebrated work, intitled, *L'Origine des Loix, des Arts, des Sciences, et de leur Progrès chez les anciens Peuples*, 1758, 3 vols 4to. His father was an advocate, and he was born at Paris in 1716. He was very unpromiſing as to abilities, and reckoned even dull, in his early years; but his underſtanding developing itſelf, he applied to letters, and at length produced the above work. The reputation he gained by it was great; but he enjoyed it a very ſhort time; dying the ſame year of the ſmallpox, which diſorder, it ſeems, he always dreaded. It is remarkable, that Conrad Fugere, to whom he left his library and his MSS. was ſo deeply affected with the death of his friend, as to die himſelf three days after him. The above work has been tranſlated into Engliſh, and publiſhed in 3 vols 8vo.

GOITO, a town of Italy, in the duchy of Mantua, taken by the Germans in 1701, and by the prince of Heſſe in 1706. It is ſeated on the river Mincio, between the lake of Mantua and that of Garda, 10 miles north-weſt of Mantua. E. Long. 11. 0. N. Lat. 45. 16.

GOLCONDA, a kingdom of Aſia, in the peninſula on this ſide the Ganges. It is bounded on the north by that of Orixa, on the weſt by that of Balagate, on the ſouth by Biſnagar, and on the eaſt by the gulf of Bengal. It abounds in corn, rice, and cattle; but that which renders it moſt remark-

able

Gold. able are the diamond-mines, they being the moſt conſiderable in the world: they are uſually purchaſed of the black merchants, who buy parcels of ground to ſearch for theſe precious ſtones in. They ſometimes fail in meeting with any, and in others they find immenſe riches. They have alſo mines of ſalt, fine iron for ſword-blades, and curious callicoes and chintzes. It is ſubject to the Great Mogul; and has a town of the ſame name, ſeated at the foot of a mountain, being one of the largeſt in the Eaſt Indies. It is about ſix miles in circumference; and was formerly the reſidence of the kings, till it was conquered by the Great Mogul. It is now much frequented by the European merchants. E. Long. 70. 10. N. Lat. 16. 30.

GOLD, the moſt valuable of all the metals, is of a bright yellow colour when pure, but becomes more or leſs white in proportion as it is alloyed with other metals. It is the heavieſt of all known bodies, platina only excepted. See CHEMISTRY and MINERALOGY *Index*.

Method of Recovering GOLD *from Gilt Works.* The ſolubility of gold, and the indiſſolubility of ſilver, in aqua regia, affords a principle on which gold may be ſeparated from the ſurface of ſilver; and, on this foundation, different proceſſes have been contrived, of which the two following appear to be the beſt.—Some powdered ſal ammoniac, moiſtened with aquafortis into the conſiſtence of a paſte, is ſpread upon the gilt ſilver, and the piece heated till the matter ſmokes and becomes nearly dry: being then thrown into water, it is rubbed with a ſcratch bruſh compoſed of fine braſs wire bound together; by which the gold eaſily comes off. The other way is, by putting the gilt ſilver into common aqua regia, kept ſo hot as nearly to boil, and turning the metal frequently till it becomes all over black; it is then to be waſhed with a little water, and rubbed with the ſcratch bruſh, to get off what gold the aqua regia may have left. This laſt method appears preferable to the other; as the ſame aqua regia may be made to ſerve repeatedly till it becomes ſaturated with the gold, after which the gold may be recovered pure by precipitation with ſulphate of iron.

For ſeparating gold from gilt copper, ſome direct a ſolution of borax to be applied on the gilt parts, but nowhere elſe, with a pencil, and a little powdered ſulphur to be ſprinkled on the places thus moiſtened; the principal uſe of the ſolution of borax ſeems to be to make the ſulphur adhere; the piece being then made red hot, and quenched in water, the gold is ſaid to be ſo far looſened, as to be wiped of with a bruſh. Others mix the ſulphur with nitre and tartar, and form the mixture with vinegar into a paſte, which is ſpread upon the gilt parts.

Schlutter recommends mechanical means, as being generally the leaſt expenſive, for ſeparating gold from the ſurface both of ſilver and copper. If the gilt veſſel is round, the gold is conveniently got off by turning it in a lathe, and applying a proper tool, a ſkin being placed underneath for receiving the ſhavings: he ſays it is eaſy to collect into two ounces of ſhavings all the gold of a gilt veſſel weighing thrice as many pounds. Where the figure of the piece does not admit of this method, it is to be properly fixed, and ſcrapers applied of different kinds according to its ſize and figure; ſome large, and furniſhed with two handles, one at each end; others ſmall and narrow, for penetrating into depreſſed parts. If the gold cannot be got off by either of theſe ways, the file muſt be had recourſe to, which takes off more of the metal underneath than the turning tool or the ſcraper, particularly than the former. The gold ſcrapings or filings may be purified from the ſilver or copper they contain, by the methods deſcribed under the article METALLURGY. Gold.

The editors of the *Encyclopédie* give a method of recovering the gold from wood that has been gilt on a water ſize: this account is extracted from a memoir on the ſame ſubject, preſented to the Academy of Sciences by M. de Montamy. The gilt wood is ſteeped for a quarter of an hour in a quantity of water ſufficient to cover it, made very hot: the ſize being thus ſoftened, the wood is taken out, and ſcrubbed piece by piece, in a little warm water, with ſhort ſtiff briſtle bruſhes of different ſizes, ſome ſmall for penetrating into the carvings, and others large for the greater diſpatch in flat pieces. The whole mixture of water, ſize, gold, &c. is to be boiled to dryneſs, the dry matter made red hot in a crucible to burn off the ſize, and the remainder ground with mercury, either in a mortar, or, where the quantity is large, in a mill.

GOLD-Coaſt. See GUINEA.

GOLD-Wire, a cylindrical ingot of ſilver, ſuperficially gilt or covered with gold at the fire, and afterwards drawn ſucceſſively through a great number of little round holes, of a wire-drawing iron, each leſs than the other, till it be ſometimes no bigger than a hair of the head. See *WIRE-Drawing*.

It may be obſerved that, before the wire be reduced to this exceſſive fineneſs, it is drawn through above 140 different holes; and that each time they draw it, it is rubbed afreſh over with new wax, both to facilitate its paſſage, and to prevent the ſilver's appearing through it.

GOLD-Wire flatted, is the former wire flatted between two rollers of poliſhed ſteel, to fit it to be ſpun on a ſtick, or to be uſed flat, as it is, without ſpinning, in certain ſtuffs, laces, embroideries, &c. See STUFF, &c.

GOLD-Thread, or *Spun-gold*, is flatted gold, wrapped or laid over a thread of ſilk, by twiſting it with wheel and iron bobbins.

To diſpoſe the wire to be ſpun on ſilk, they paſs it between two rollers of a little mill: theſe rollers are of nicely poliſhed ſteel, and about three inches in diameter. They are ſet very cloſe to each other, and turned by means of a handle faſtened to one of them, which gives motion to the other. The gold wire in paſſing between the two is rendered quite flat, but without loſing any thing of its gilding; and is rendered ſo exceedingly thin and flexible, that it is eaſily ſpun on ſilk-thread, by means of a hand-wheel, and ſo wound on a ſpool or bobbin. See *WIRE-Drawing*.

GOLD-Leaf or *Beaten Gold*, is gold beaten with a hammer into exceeding thin leaves, ſo that it is computed, that an ounce may be beaten into 1600 leaves, each three inches ſquare, in which ſtate it takes up more than 159,052 times its former ſurface.

The preparation of gold leaf, according to Dr Lewis, is as follows:

"The gold is melted in a black-lead crucible, with ſome

Gold. ſome borax, in a wind furnace, called by the workmen a *wind-hole*: as ſoon as it appears in perfect fuſion, it is poured out into an iron ingot mould, ſix or eight inches long, and three quarters of an inch wide, previouſly greaſed, and heated, ſo as to make the tallow run and ſmoke, but not to take flame. The bar of gold is made red hot, to burn off the unctuous matter, and forged on an anvil into a long plate, which is further extended by being paſſed repeatedly between poliſhed ſteel rollers, till it becomes a ribbon as thin as paper. Formerly the whole of this extenſion was procured by means of the hammer, and ſome of the French workmen are ſtill ſaid to follow the ſame practice: but the uſe of the flatting mill both abridges the operation, and renders the plate of more uniform thickneſs. The ribbon is divided by compaſſes, and cut with ſheers into equal pieces, which conſequently are of equal weights: theſe are forged on an anvil till they are an inch ſquare; and afterwards well nealed, to correct the rigidity which the metal has contracted in the hammering and flatting. Two ounces of gold, or 960 grains, the quantity which the workmen uſually melt at a time, make 150 of theſe ſquares, whence each of them weighs ſix grains and two-fifths; and as 902 grains of gold make a cubic inch, the thickneſs of the ſquare plates is about the 766th part of an inch.

"In order to the further extenſion of theſe pieces into fine leaves, it is neceſſary to interpoſe ſome ſmooth body between them and the hammer, for ſoftening its blow, and defending them from the rudeneſs of its immediate action: as alſo to place between every two of the pieces ſome proper intermedium, which, while it prevents their uniting together, or injuring one another, may ſuffer them freely to extend. Both theſe ends are anſwered by certain animal membranes.

"The goldbeaters uſe three kinds of membranes; for the outſide cover, common parchment made of ſheep ſkin; for interlaying with the gold, firſt the ſmootheſt and cloſeſt vellum, made of calf ſkin; and afterwards the much finer ſkins of ox gut, ſtript off from the large ſtraight gut ſlipt open, curiouſly prepared on purpoſe for this uſe, and hence called *gold-beater's ſkin*. The preparation of theſe laſt is a diſtinct buſineſs, practiſed by only two or three perſons in the kingdom, ſome of the particulars of which I have not ſatisfactorily learned. The general proceſs is ſaid to conſiſt, in applying one upon another, by the ſmooth ſides, in a moiſt ſtate, in which they readily cohere and unite inſeparably; ſtretching them on a frame, and carefully ſcraping off the fat and rough matter, ſo as to leave only the fine exterior membrane of the gut; beating them between double leaves of paper, to force out what unctuoſity may remain in them; moiſtening them once or twice with an infuſion of warm ſpices; and laſtly, drying and preſſing them. It is ſaid, that ſome calcined gypſum, or plaſter of Paris, is rubbed with a hare's foot both on the vellum and the ox gut ſkins, which fills up ſuch minute holes as may happen in them, and prevents the gold leaf from ſticking, as it would do to the ſimple animal membrane. It is obſervable, that, notwithſtanding the vaſt extent to which the gold is beaten between theſe ſkins, and the great tenuity of the ſkins themſelves, yet they ſuſtain continual repetitions of the proceſs for ſeveral months, without extending or growing thinner. Our workmen find, that, after 70 or 80 repetitions, the ſkins, though they contract no flaw, will no longer permit the gold to extend between them; but that they may be again rendered fit for uſe by impregnating them with the virtue which they have loſt, and that even holes in them may be repaired by the dexterous application of freſh pieces of ſkin: a microſcopical examination of ſome ſkins that had been long uſed plainly ſhowed theſe repairs. The method of reſtoring their virtue is ſaid in the *Encyclopédie* to be, by interlaying them with leaves of paper moiſtened with white wine vinegar, beating them for a whole day, and afterwards rubbing them over as at firſt with plaſter of Paris. The gold is ſaid to extend between them more eaſily, after they have been uſed a little, than when they are new. Gold.

"The beating of the gold is performed on a ſmooth block of black marble, weighing from 200 to 600 pounds, the heavier the better; about nine inches ſquare on the upper ſurface, and ſometimes leſs, fitted into the middle of a wooden frame, about two feet ſquare, ſo as that the ſurface of the marble and the frame form one continuous plane. Three of the ſides are furniſhed with a high ledge; and the front, which is open, has a leather flap faſtened to it, which the gold-beater takes before him as an apron, for preſerving the fragments of gold that fall off. Three hammers are employed, all of them with two round and ſomewhat convex faces, though commonly the workman uſes only one of the faces: the firſt, called the *cutch hammer*, is about four inches in diameter, and weighs 15 or 16 pounds, and ſometimes 20, though few workmen can manage thoſe of this laſt ſize: the ſecond, called the *ſhoddering hammer*, weighs about 12 pounds, and is about the ſame diameter: the third, called the *gold hammer*, or *finiſhing hammer*, weighs 10 or 11 pounds, and is nearly of the ſame width. The French uſe four hammers, differing both in ſize and ſhape from thoſe of our workmen: they have only one face, being in figure truncated cones. The firſt has very little convexity, is near five inches in diameter, and weighs 14 or 15 pounds: the ſecond is more convex than the firſt, about an inch narrower, and ſcarcely half its weight: the third, ſtill more convex, is only about two inches wide, and four or five pounds in weight: the fourth or finiſhing hammer is near as heavy as the firſt, but narrower by an inch, and the moſt convex of all. As theſe hammers differ ſo remarkably from ours, I thought proper to inſert them, leaving the workmen to judge what advantage one ſet may have above the other.

"A hundred and fifty of the pieces of gold are interlaid with leaves of vellum, three or four inches ſquare, one vellum leaf being placed between every two of the pieces, and about 20 more of the vellum leaves on the outſides; over theſe is drawn a parchment caſe, open at both ends, and over this another in a contrary direction, ſo that the aſſemblage of gold and vellum leaves is kept tight and cloſe on all ſides. The whole is beaten with the heavieſt hammer, and every now and then turned upſide down, till the gold is ſtretched to the extent of the vellum; the caſe being from time to time opened for diſcovering how the extenſion goes on, and the packet, at times, bent and rolled

Gold. rolled as it were between the hands, for procuring ſufficient freedom to the gold, or, as the workmen ſay, to make the gold work. The pieces taken out from between the vellum leaves, are cut in four with a ſteel knife; and the 600 diviſions, hence reſulting, are interlaid, in the ſame manner, with pieces of the ox-gut ſkins five inches ſquare. The beating being repeated with a lighter hammer till the golden plates have again acquired the extent of the ſkins, they are a ſecond time divided in four: the inſtrument uſed for this diviſion is a piece of cane cut to an edge, the leaves being now ſo light, that the moiſture of the air or breath condenſing on a metalline knife would occaſion them to ſtick to it. Theſe laſt diviſions being ſo numerous, that the ſkins neceſſary for interpoſing between them would make the packet too thick to be beaten at once, they are parted into three parcels, which are beaten ſeparately, with the ſmalleſt hammer, till they are ſtretched for the third time to the ſize of the ſkins: they are now found to be reduced to the greateſt thinneſs they will admit of; and indeed many of them, before this period, break or fail. The French workmen, according to the minute detail of this proceſs given in the *Encyclopédie*, repeat the diviſion and the beating once more; but as the ſquares of gold, taken for the firſt operation, have four times the area of thoſe uſed among us, the number of leaves from an equal area is the ſame in both methods, viz. 16 from a ſquare inch. In the beating, however ſimple the proceſs appears to be, a good deal of addreſs is requiſite, for applying the hammers ſo as to extend the metal uniformly from the middle to the ſides: one improper blow is apt not only to break the gold leaves, but to cut the ſkins.

"After the laſt beating, the leaves are taken up by the end of a cane inſtrument, and, being blown flat on a leather cuſhion, are cut to a ſize, one by one, with a ſquare frame of cane made of a proper ſharpneſs, or with a frame of wood edged with cane: they are then fitted into books of 25 leaves each, the paper of which is well ſmoothed, and rubbed with red bole to prevent their ſticking to it. The French, for ſizing the leaves, uſe only the cane knife; cutting them firſt ſtraight on one ſide, fitting them into the book by the ſtraight ſide, and then paring off the ſuperfluous parts of the gold about the edges of the book. The ſize of the French gold leaves is from ſomewhat leſs than three inches to three and three quarters ſquare; that of ours, from three inches to three and three-eighths.

"The proceſs of gold-beating is conſiderably influenced by the weather. In wet weather, the ſkins grow ſomewhat damp, and in this ſtate make the extenſion of the gold more tedious: the French are ſaid to dry and preſs them at every time of uſing; with care not to overdry them, which would render them unfit for farther ſervice. Our workmen complain more of froſt, which appears to affect the metalline leaves themſelves: in froſt, a gold leaf cannot eaſily be blown flat, but breaks, wrinkles, or runs together.

"Gold leaf ought to be prepared from the fineſt gold; as the admixture of other metals, though in too ſmall a proportion to affect ſenſibly the colour of the leaf, would diſpoſe it to loſe of its beauty in the air. And indeed there is little temptation to the workman to uſe any other; the greater hardneſs of alloyed gold occaſioning as much to be loſt in point of time and labour, and in the greater number of leaves that break, as can be gained by any quantity of alloy that would not be at once diſcoverable by the eye. All metals render gold harder and more difficult of extenſion. Even ſilver, which in this reſpect ſeems to alter its quality leſs than any other metal, produces with gold a mixture ſenſibly harder than either of them ſeparately, and this hardneſs is in no art more felt than in the goldbeater's. The French are ſaid to prepare what is called the *green gold leaf*, from a compoſition of one part of copper and two of ſilver with eighty of gold. But this is probably a miſtake: for ſuch an admixture gives no greenneſs to gold: and I have been informed by our workmen, that this kind of leaf is made from the ſame fine gold as the higheſt gold-coloured ſort, the greeniſh hue being only a ſuperficial teint induced upon the gold in ſome part of the proceſs: this greeniſh leaf is little otherwiſe uſed than for the gilding of certain books. Gold.

"But though the goldbeater cannot advantageouſly diminiſh the quantity of gold in the leaf by the admixture of any other ſubſtance with the gold, yet means have been contrived for ſome particular purpoſes, of ſaving the precious metal, by producing a kind of leaf, called *party-gold*, whoſe baſis is ſilver, and which has only a ſuperficial coat of gold upon one ſide: a thick leaf of ſilver and a thinner one of gold, laid flat on one another, heated and preſſed together, unite and cohere; and being then beaten into fine leaves, as in the foregoing proceſs, the gold, though its quantity is only about one-fourth of that of the ſilver, continues everywhere to cover it, the extenſion of the former keeping pace with that of the latter."

But it is to obſerved by Mr Nicholſon, that pure gold is too ductile to be worked between the goldbeater's ſkin. The neweſt ſkins will work the fineſt gold, and make the thinneſt leaf, becauſe they are the ſmootheſt. Old ſkins, being rough or foul, require coarſer gold. The finer the gold, the more ductile; inſomuch, that pure gold, when driven out by the hammer, is too ſoft to force itſelf over the irregularities, but would paſs round them, and by that means become divided into narrow ſlips. The fineſt gold for this purpoſe, has three grains of alloy in the ounce, and the coarſeſt twelve grains. In general the alloy is ſix grains, or one-eightieth part. That which is called pale gold contains three pennyweights of ſilver in the ounce. The alloy of gold leaf is ſilver, or copper, or both, and the colour is produced of various tints accordingly. Two ounces and two pennyweights of gold is delivered by the maſter to the workman, who, if extraordinarily ſkilful, returns two thouſand leaves, or eighty books of gold, together with one ounce and ſix pennyweights of waſte cuttings. Hence one book weighs 4.8 grains; and as the leaves meaſure 3.3 inches in the ſide, the thickneſs of the leaf is one two hundred and eighty-two thouſandth part of an inch.

The yellow metal called Dutch gold is fine braſs. It is ſaid to be made from copper plates, by cementation with calamine, without ſubſequent fuſion. Its thickneſs, compared with that of leaf gold, proved as 19 to 4, and under equal ſurfaces it is conſiderably more than twice as heavy as the gold. *Jour.* vol. i.

It

Gold, Golden.

It muſt be obſerved, however, that gold is beaten more or leſs, according to the kind or quality of the work it is intended for; that for the gold-wire drawers to gild their ingots withal, is left much thicker than that for gilding the frames of pictures, &c. See GILDING.

GOLD Brocade. See BROCADE.

Fulminating GOLD. See CHEMISTRY *Index.*

Moſaic GOLD, is gold applied in pannels on a proper ground, diſtributed into ſquares, lozenges, and other compartments; part of which is ſhadowed to raiſe or heighten the reſt. See MOSAIC.

GOLD Plates for Enamelling are generally made of ducat gold, whoſe fineneſs is from $23\frac{1}{2}$ to $23\frac{3}{4}$ carats; and the fineſt gold is the beſt for this purpoſe, unleſs where ſome parts of the gold are left bare and unpoliſhed, as in watch-caſes, ſnuff-boxes, &c. for which purpoſe a mixture of alloy is neceſſary, and ſilver is preferred to copper, becauſe the latter diſpoſes the plates to tarniſh and turn green. See ENAMELLING.

Shell-Gold is that uſed by the gilders and illuminers, and with which gold letters are written. It is made by grinding gold leaves, or gold-beaters fragments, with a little honey, and afterwards ſeparating the honey from the powdered gold by means of water. When the honey is waſhed away, the gold may be put on paper or kept in ſhells; whence its name. When it is uſed, it is diluted with gum-water or ſoap-ſuds.—The German gold-powder, prepared from the Dutch gold leaf in the ſame manner, is generally uſed; and when it is well ſcoured with varniſh, anſwers the end in japanners gilding as well as the genuine.

GOLD Size for burniſhed gilding is prepared of one pound and a half of tobacco-pipe clay, half an ounce of red chalk, a quarter of an ounce of black lead, forty drops of ſweet oil, and three drams of pure tallow; grind the clay, chalk, and black lead, ſeparately, very fine in water; then mix them together, add the oil and tallow, and grind the mixture to a due conſiſtence.

Gold ſize of japanners may be made by pulverizing gum animi and aſphaltum, of each one ounce; red lead, litharge of gold, and umber, of each one ounce and a half, mixing them with a pound of linſeed oil, and boiling them, obſerving to ſtir them till the whole be incorporated, and appears on growing cold of the conſiſtence of tar: ſtrain the mixture through a flannel, and keep it ſtopped up in a bottle for uſe. When it is uſed, it muſt be ground with as much vermilion as will give it an opaque body, and diluted with oil of turpentine, ſo that it may be worked freely with the pencil. A ſimple preparation conſiſts of one pound of linſeed oil and four ounces of gum animi; powder the gum, and mix it gradually with the boiling oil; let it continue to boil till it becomes of the conſiſtence of tar; ſtrain it through a coarſe cloth; keep and uſe it as the other.

GOLD-Finch. See FRINGILLA, ORNITHOLOGY *Index.*

GOLD-Fiſh. See CYPRINUS, ICHTHYOLOGY *Index.*

GOLDEN, ſomething that has a relation to gold or conſiſts of gold.

GOLDEN Calf, was a figure of a calf, which the Iſraelites caſt in that metal, and ſet up in the wilderneſs to worſhip during Moſes's abſence in the mount; and which that legiſlator at his return burnt, grinded to powder, and mixed with the water the people were to drink off; as related in Exod. xxxii. The commentators have been divided on this article; the pulverizing of gold, and rendering it potable, is a very difficult operation in chemiſtry. Many, therefore, ſuppoſe it done by a miracle; and the reſt, who allow of nothing ſupernatural in it, advance nothing but conjectures as to the manner of the proceſs. Moſes could not have done it by ſimple calcination, nor amalgamation, nor antimony, nor calcination; nor is there one of thoſe operations that quadrates with the text. Golden.

M. Stahl has endeavoured to remove this difficulty. The method Moſes made uſe of, according to this author, was by diſſolving the metal with hepar ſulphuris; only, inſtead of the vegetable alkali, he made uſe of the Egytian natron, which is common enough throughout the eaſt.

GOLDEN-Fleece, in the ancient mythology, was the ſkin or fleece of the ram upon which Phryxus and Hella are ſuppoſed to have ſwam over the ſea to Colchis; and which being ſacrificed to Jupiter, was hung upon a tree in the grove of Mars, guarded by two brazen-hoofed bulls, and a monſtrous dragon that never ſlept; but was taken and carried off by Jaſon and the Argonauts.

Many authors have endeavoured to ſhow that this fable is an allegorical repreſentation of ſome real hiſtory, particularly of the philoſophers ſtone. Others have explained it by the profit of the wool trade to Colchis, or the gold which they commonly gathered there with fleeces in the rivers. See ARGONAUTS.

Order of the GOLDEN Fleece, is a military order inſtituted by Philip the Good, duke of Burgundy, in 1429. It took its denomination from a repreſentation of the golden fleece, borne by the knights on their collars, which conſiſted of flints and ſteels. The king of Spain is now grand-maſter of the order, in quality of duke of Burgundy: the number of knights is fixed to thirty-one.

It is uſually ſaid to have been inſtituted on occaſion of an immenſe profit which that prince made by wool; though others will have a chemical myſtery couched under it, as under that famous one of the ancients, which the adepts contend to be no other than the ſecret of the elixir, wrote on the fleece of a ſheep.

Oliver de la Marche writes, that he had ſuggeſted to Philip I. archduke of Auſtria, that the order was inſtituted by his grandfather Philip the Good duke of Burgundy, with a view to that of Jaſon; and that John Germain biſhop of Chalons, chancellor of the order, upon this occaſion made him change his opinion, and aſſured the young prince that the order had been inſtituted with a view to the fleece of Gideon. William biſhop of Tournay, chancellor likewiſe of the order, pretends that the duke of Burgundy had in view both the golden fleece of Jaſon and Jacob's fleece; i. e. the ſpecked ſheep belonging to this patriarch, according to agreement made with his father-in-law Laban. Which ſentiment gave birth to a great work of this prelate in two parts: in the firſt, under the ſymbol of the fleece of Jaſon, is repreſented the virtue of magnanimity, which a knight ought to poſſeſs; and under the ſymbol of the fleece of Jacob he repreſents the virtue of juſtice.

Paradin

Golden Goldoni.

Paradin is of the ſame mind; and tells us, that the duke deſigned to inſinuate that the fabulous conqueſt which Jaſon is ſaid to have made of the golden fleece in Colchis, was nothing elſe but the conqueſt of virtue, which gains a victory over thoſe horrible monſters vice and our evil inclinations.

GOLDEN Number, in *Chronology*, a number ſhowing what year of the moon's cycle any given year is. See CHRONOLOGY, N° 27—30.

GOLDEN Rod, in *Botany*. See SOLIDAGO, BOTANY *Index*.

GOLDEN Roſe. The pope annually conſecrates a golden roſe on the fourth Sunday in Lent, which is ſent to princeſſes, or to ſome church, as a mark of his peculiar affection.

GOLDEN Rule, in *Arithmetic*, a rule or praxis, of great uſe and extent in the art of numbers; whereby we find a fourth proportional to three quantities given.

The golden rule is alſo called the *Rule of Three*, and *Rule of Proportion*. See its nature and uſe under the article ARITHMETIC, N° 13.

GOLDENGEN, a town of Poland in the duchy of Courland, with a handſome caſtle, ſeated on the river Weia, in E. Long. 21. 44. N. Lat. 56. 48.

GOLDONI, CHARLES, a comic writer of conſiderable eminence, was born at Venice in the year 1707, in which city his father acted in the capacity of phyſician. His attachment to the drama became conſpicuous even in childhood, which his father was fond of countenancing, erecting a theatre in his own houſe, where young Goldoni and ſome of his companions were the actors. It is ſaid that he even drew the outlines of a comedy of his own invention when he was no more than eight years of age—a moſt extraordinary indication of his future eminence. He ſtudied rhetoric at Perugia, in the college of the Jeſuits, and proſecuted his philoſophical ſtudies at Rimini. The ſtage, however, had too many charms to allow him to pay much attention to Ariſtotle or Quintilian, and he eloped from Rimini with a company of comedians when they removed to Chiozza. In vain did his father attempt to make him fall in love with phyſic, or the ſtudy of the law; yet his ardent imagination was ſo forcibly ſtruck with a particular church-ceremony, that he formed the reſolution of commencing capuchin, but the diſſipation of Venice ſoon deſtroyed this reſolution. After the demiſe of his father, he was prevailed upon by his ſurviving parent to take up the profeſſion of the law for immediate ſupport, but ſome unknown reaſons induced him to quit the bar, after which he went to Milan, where he was appointed ſecretary to the Venetian reſident.

At Milan he brought out his firſt performance, under the title of *Il Gondoliere Veneziano*. He removed afterwards to Verona, where he joined himſelf to a company of players; and here too he entered into a ſtate of wedlock. He compoſed a number of pieces for the players to whom he attached himſelf. While at Venice, he formed the laudable reſolution of reforming the Italian ſtage, which at that time was diſgraced by contemptible farce and low buffoonery. He made himſelf acquainted with the true nature of comedy, and kept within the limits of nature and decorum. Such was the fertility of his genius, and ſuch his indefatigable induſtry, that he produced no fewer than ſixteen comedies and 42 other theatrical pieces in the courſe of twelve months! And what is moſt aſtoniſhing, ſome of theſe haſty performances are deemed his maſterpieces. Goldoni. Goldſmith.

His works in 10 vols. 8vo. were firſt printed in 1753, and in 1761 his new pieces amounted to 59. About this time he was invited to Paris by the manager of the Italian theatre in that city, to compoſe pieces for the ſtage, of which invitation he accepted. His firſt attempt was unſucceſsful, becauſe he had to contend with the pantomime drollery, which was moſt agreeable to the depraved taſte of the times. When about to leave Paris on the expiration of his engagement, he was introduced to the court, and appointed teacher of the Italian language to the princeſſes. He had lodgings in Verſailles, but his penſion was not ſufficient to keep him from writing for the ſtage. When 62 years old, he ventured to compoſe in a foreign language, his *La Bourru Bienfaiſant*, which was received in the court theatre with extraordinary applauſe. He was deprived of his penſion in conſequence of the revolution, and reduced to indigence. It ought to be confeſſed, however, that this verſatile nation was juſt about to make him amends when he expired in 1792, and in the 85th year of his age. If the rapidity with which Goldoni compoſed was ſuch as to prevent him from ranking with authors of the firſt claſs, it cannot be denied that his talent for comedy was very great. Some have given him the appellation of the *Moliere of Italy*, but this perhaps is too flattering a title. His whole works were printed at Leghorn about the years 1788 and 1791, in 31 volumes 8vo.

GOLDSMITH, or, as ſome chooſe to expreſs it, *ſilverſmith*, an artiſt who makes veſſels, utenſils, and ornaments, in gold and ſilver.

The goldſmith's work is either performed in the mould, or beat out with the hammer or other engine. All works that have raiſed figures are caſt in a mould, and afterwards poliſhed and finiſhed; plates or diſhes, of ſilver or gold, are beat out from thin flat plates; and tankards, and other veſſels of that kind, are formed of plates ſoldered together, and their mouldings are beat, not caſt. The buſineſs of the goldſmiths formerly required much more labour than it does at preſent; for they were obliged to hammer the metal from the ingot to the thinneſs they wanted; but there are now invented flatting-mills, which reduce metals to the thinneſs that is required, at a very ſmall expence. The goldſmith is to make his own moulds; and for that reaſon, ought to be a good deſigner, and have a taſte in ſculpture: he ought alſo to know enough of metallurgy to be able to aſſay mixed metals, and to mix the alloy.

The goldſmiths in London employ ſeveral hands under them for the various articles of their trade; ſuch are the jeweller, the ſnuff-box and toy-maker, the ſilver-turner, the gilder, the burniſher, the chaſer, the refiner, and the gold-beater.

Goldſmiths are ſuperior tradeſmen; their wares muſt be aſſayed by the wardens of the company of this name in London, and marked; and gold is to be of a certain touch. No goldſmith may take above one ſhilling the ounce of gold, beſides what he has for the faſhioning, more than the buyer may be allowed for it at the king's exchange; and here any falſe metal ſhall be ſeized and forfeited to the king. The cities

Goldſmith. of York, Exeter, Briſtol, &c. are places appointed for the aſſaying wrought plate of goldſmiths; alſo a duty is granted on ſilver-plate of ſixpence an ounce, &c. Plate made by goldſmiths ſhall be of a particular fineneſs, on pain of forfeiting 10l. and if any parcel of plate ſent to the aſſayers is diſcovered to be of a coarſer alloy than the reſpective ſtandards, it may be broken and defaced; and the fees for aſſaying are particularly limited.

GOLDSMITH, *Oliver*, a celebrated Engliſh writer, was born at Roſcommon in Ireland in the year 1731. His father, who poſſeſſed a ſmall eſtate in that county, had nine ſons, of whom Oliver was the third. He was originally intended for the church; and with that view, after being well inſtructed in the claſſics, was, with his brother, the Rev. Henry Goldſmith, placed in Trinity College, Dublin, about the latter end of the year 1749. In this ſeminary of learning he continued a few years, when he took a bachelor's degree: but his brother not being able to obtain any preferment after he left the college, Oliver, by the advice of Dean Goldſmith of Cork, turned his thoughts to the ſtudy of phyſic; and, after attending ſome courſes of anatomy in Dublin, proceeded to Edinburgh in the year 1751, where he ſtudied the ſeveral branches of medicine under the different profeſſors in that univerſity. His beneficent diſpoſition ſoon involved him in unexpected difficulties; and he was obliged precipitately to leave Scotland, in conſequence of engaging himſelf to pay a conſiderable ſum of money for a fellow-ſtudent.

A few days after, about the beginning of the year 1754, he arrived at Sunderland, near Newcaſtle, where he was arreſted at the ſuit of a taylor in Edinburgh, to whom he had given ſecurity for his friend.

By the good offices of Laughlan Maclane, Eſq. and Dr Sleigh, who were then in the college, he was ſoon delivered out of the hands of the bailiff; and took his paſſage on board a Dutch ſhip to Rotterdam, where, after a ſhort ſtay, he proceeded to Bruſſels; he then viſited great part of Flanders; and after paſſing ſome time at Straſburg and Louvain, where he obtained a degree of bachelor of phyſic, he accompanied an Engliſh gentleman to Berne and Geneva.

It is undoubtedly fact, that this ingenious unfortunate man travelled on foot moſt part of his tour. He had left England with very little money; and being of a philoſophical turn, and at that time poſſeſſing a body capable of ſuſtaining every fatigue, and a heart not eaſily terrified at danger, he became an enthuſiaſt to the deſign he had formed of ſeeing the manners of different countries. He had ſome knowledge of the French language and of muſic, and he played tolerably well on the German flute; which, from an amuſement, became at ſome times the means of ſubſiſtence. His learning produced him a hoſpitable reception at moſt of the religious houſes; and his muſic made him welcome to the peaſants of Flanders and other parts of Germany. "Whenever I approached," he uſed to ſay, "a peaſant's houſe towards night-fall, I played one of my moſt merry tunes; and that procured me not only a lodging, but ſubſiſtence for the next day: but in truth (his conſtant expreſſion), I muſt own, whenever I attempted to entertain perſons of a higher rank, they always thought my performance odious, and never made me any return for my endeavours to Goldſmith. pleaſe them."

On Mr Goldſmith's arrival at Geneva, he was recommended as a proper perſon for a travelling tutor to a young man, who had been unexpectedly left a conſiderable ſum of money by his uncle Mr S——, formerly an eminent pawnbroker near Holborn. This youth, who had been articled to an attorney, on receipt of his fortune determined to ſee the world; and, on his engaging with his preceptor, made a proviſo that he ſhould be permitted to govern himſelf; and Goldſmith ſoon found his pupil underſtood the art of directing in money-concerns extremely well, as avarice was his prevailing paſſion. His queſtions were uſually how money might be ſaved, and which was the leaſt expenſive courſe of travelling; whether any thing could be bought that would turn to account when diſpoſed of again in London? Such curioſities on the way as could be ſeen for nothing he was ready enough to look at; but if the ſight of them was to be paid for, he uſually aſſerted that he had been told they were not worth ſeeing. He never paid a bill that he would not obſerve how amazingly expenſive travelling was; and all this, though he was not yet twenty-one. During Goldſmith's continuance in Switzerland, he aſſiduouſly cultivated his poetical talent, of which he had given ſome ſtriking proofs while at the college of Edinburgh. It was here he ſent the firſt ſketch of his delightful poem called the *Traveller*, to his brother the clergyman in Ireland, who, giving up fame and fortune, had retired with an amiable wife, to happineſs and obſcurity, on an income of only 40l. a-year.

From Geneva Mr Goldſmith and his pupil viſited the ſouth of France; where the young man, upon ſome diſagreement with his preceptor, paid him the ſmall part of his ſalary which was due, and embarked at Marſeilles for England. Our wanderer was left once more upon the world at large, and paſſed through a variety of difficulties in traverſing the greateſt part of France. At length his curioſity being ſatiated, he bent his courſe towards England, and arrived at Dover the beginning of the winter 1758. When he came to London, his ſtock of caſh did not amount to two livres. An entire ſtranger in this metropolis, his mind was filled with the moſt gloomy reflections on his embarraſſed ſituation. With ſome difficulty he diſcovered that part of the town in which his old acquaintance Dr Sleigh reſided. This gentleman received him with the warmeſt affection, and liberally invited him to ſhare his purſe till ſome eſtabliſhment could be procured for him. Goldſmith, unwilling to be a burden to his friend, a ſhort time after eagerly embraced an offer which was made him to aſſiſt the late Rev. Dr Milner in inſtructing the young gentlemen at the academy at Peckham; and acquitted himſelf greatly to the Doctor's ſatisfaction for a ſhort time: but having obtained ſome reputation by the criticiſms he had written in the Monthly Review, Mr Griffith, the proprietor, engaged him in the compilation of it; and, reſolving to purſue the profeſſion of writing, he returned to London, as the mart where abilities of every kind were ſure of meeting diſtinction and reward. As his finances were by no means in a good ſtate, he determined to adopt a plan of the ſtricteſt economy: and took

Goldſmith. took lodgings in an obſcure court in the Old Bailey, where he wrote ſeveral ingenious little pieces. The late Mr Newberry, who at that time gave great encouragement to men of literary abilities, became a kind of patron to our young author; and introduced him as one of the writers in the Public Ledger, in which his Citizen of the World originally appeared, under the title of *Chineſe Letters*.

Fortune now ſeemed to take ſome notice of a man ſhe had long neglected. The ſimplicity of his character, the integrity of his heart, and the merit of his productions, made his company very acceptable to a number of reſpectable families; and he emerged from his ſhabby apartments in the Old Bailey to the politer air of the Temple, where he took handſome chambers, and lived in a genteel ſtyle. The publication of his Traveller, and his Vicar of Wakefield, was followed by the performance of his comedy of the Good-natured Man at Covent Garden theatre, and placed him in the firſt rank of the poets of the age.

Among many other perſons of diſtinction who were deſirous to know him was the duke of Northumberland; and the circumſtance that attended his introduction to that nobleman is worthy of being related, in order to ſhow a ſtriking trait of his character. "I was invited," ſaid the Doctor, (as he was then univerſally called), "by my friend Mr Percy, to wait upon the duke, in conſequence of the ſatisfaction he had received from the peruſal of one of my productions. I dreſſed myſelf in the beſt manner I could; and, after ſtudying ſome compliments I thought neceſſary on ſuch an occaſion, proceeded to Northumberland-houſe, and acquainted the ſervants that I had particular buſineſs with his Grace. They ſhowed me into an antichamber; where, after waiting ſome time, a gentleman very genteelly dreſſed made his appearance. Taking him for the duke, I delivered all the fine things I had compoſed in order to compliment him on the honour he had done me; when, to my great aſtoniſhment, he told me I had miſtaken him for his maſter, who would ſee me immediately. At that inſtant the duke came into the apartment; and I was ſo confuſed on the occaſion, that I wanted words barely ſufficient to expreſs the ſenſe I entertained of the duke's politeneſs, and went away extremely chagrined at the blunder I had committed."

Another feature of his character we cannot help laying before the reader. Previous to the publication of his Deſerted Village, the bookſeller had given him a note for one hundred guineas for the copy, which the Doctor mentioned a few hours after to one of his friends: who obſerved, it was a very great ſum for ſo ſhort a performance. "In truth," replied Goldſmith, "I think ſo too; I have not been eaſy ſince I received it; therefore I will go back and return him his note;" which he abſolutely did; and left it entirely to the bookſeller to pay him according to the profits produced by the ſale of the piece, which turned out very conſiderable.

During the laſt rehearſal of his comedy intitled She ſtoops to Conquer, which Mr Coleman had no opinion would ſucceed, on the Doctor's objecting to the repetition of one of Tony Lumkin's ſpeeches, being apprehenſive it might injure the play, the manager with great keenneſs replied, "Pſha, my dear Doctor, do not be fearful of ſquibs, when we have been ſitting almoſt Goldſmith. theſe two hours upon a barrel of gunpowder." The piece, however, contrary to Mr Coleman's expectation, was received with uncommon applauſe by the audience; and Goldſmith's pride was ſo hurt by the ſeverity of the above obſervation, that it entirely put an end to his friendſhip for the gentleman that made it.

Notwithſtanding the great ſucceſs of his pieces, by ſome of which it is aſſerted, upon good authority, he cleared 1800l. in one year, his circumſtances were by no means in a proſperous ſituation; which was partly owing to the liberality of his diſpoſition, and partly to an unfortunate habit he had contracted of gaming; the arts of which he knew very little of, and conſequently became the prey of thoſe who were unprincipled enough to take advantage of his ſimplicity.

Juſt before his death he had formed a deſign for executing an Univerſal Dictionary of Arts and Sciences, the proſpectus of which he actually publiſhed. In this work ſeveral of his literary friends, (particularly Sir Joſhua Reynolds, Dr Johnſon, Mr Beauclerc, and Mr Garrick), had undertaken to furniſh him with articles upon different ſubjects. He had entertained the moſt ſanguine expectations from the ſucceſs of it. The undertaking, however, did not meet with that encouragement from the bookſellers which he had imagined it would undoubtedly receive; and he uſed to lament this circumſtance almoſt to the laſt hour of his exiſtence.

He had been for ſome years afflicted, at different times, with a violent ſtrangury, which contributed not a little to embitter the latter part of his life; and which, united with the vexations which he ſuffered upon other occaſions, brought on a kind of habitual deſpondency. In this unhappy condition he was attacked by a nervous fever, which, being improperly treated, terminated in his diſſolution on the 4th of April 1774.

As to his character, it is ſtrongly illuſtrated by Mr Pope's line,

In wit a man, ſimplicity a child.

The learned leiſure he loved to enjoy was too often interrupted by diſtreſſes which aroſe from the liberality of his temper, and which ſometimes threw him into loud fits of paſſion: but this impetuoſity was corrected upon a moment's reflection; and his ſervants have been known, upon theſe occaſions, purpoſely to throw themſelves in his way, that they might profit by it immediately after; for he who had the good fortune to be reproved, was certain of being rewarded for it. The univerſal eſteem in which his poems were held, and the repeated pleaſure they give in the peruſal, is a ſtriking teſt of their merit. He was a ſtudious and correct obſerver of nature; happy in the ſelection of his images, in the choice of his ſubjects, and in the harmony of his verſification; and, though his embarraſſed ſituation prevented him from putting the laſt hand to many of his productions, his Hermit, his Traveller, and his Deſerted Village, bid fair to claim a place among the moſt finiſhed pieces in the Engliſh language.

Beſides the works already mentioned, he wrote, 1. Hiſtory of the earth and animated nature, 6 vols 8vo. 2. Hiſtory of England, 4 vols 8vo. 3. Hiſtory of Rome, 2 vols. 4. Abridgements of the two laſt, for

Goldſmith || Golius.

the uſe of ſchools. 5. A view of experimental philoſophy, 3 vols 8vo; a poſthumous work, not eſteemed. 6. Miſcellanies, &c.

GOLF, the name of a certain game among the Scots, and ſaid to be peculiar to their country.—Among them it has been very ancient; for there are ſtatutes prohibiting it as early as the year 1457, leſt it ſhould interfere with the ſport of archery. It is commonly played on rugged broken ground, covered with ſhort graſs, in the neighbourhood of the ſea ſhore. A field of this ſort is in Scotland called *links*. The game is generally played in parties of one or two on each ſide. Each party has an exceeding hard ball, ſomewhat larger than a hen's egg. This they ſtrike with a ſlender and elaſtic club, of about four feet long, crooked in the head, and having lead run into it, to make it heavy. The ball being ſtruck with this club, will fly to the diſtance of 200 yards, and the game is gained by the party who puts his ball into the hole with the feweſt ſtrokes. But the game does not depend ſolely upon the ſtriking of the longeſt ball, but alſo upon meaſuring the ſtrength of the ſtroke, and applying it in ſuch direction as to lay the ball in ſmooth ground, whence it may be eaſily moved at the next ſtroke. To encourage this amuſement, the city of Edinburgh, A. D. 1744, gave to the company of golfers a ſilver club, to be played for annually by the company, the victor to append a gold or ſilver piece to the prize. It has been played for every year ſince, except the years 1746 and 1747. For their better accommodation, 22 members of the company ſubſcribed 30l. each in the year 1768, for building a houſe, where their meetings might be held. The ſpot choſen for this purpoſe was the ſouth-weſt corner of Leith Links, where an area was taken in feu from the magiſtrates of Edinburgh, and a commodious houſe and tavern built upon it.

GOLIUS, JAMES, a celebrated profeſſor of Arabic and the mathematics at Leyden, was deſcended from a very honourable family, and born at the Hague in the year 1596. He was put to the univerſity of Leyden, where he ſtudied under Erpinius; and having made himſelf maſter of all the learned languages, applied himſelf to the mathematics, phyſic, and divinity. He afterwards travelled into Africa and Aſia; and became greatly eſteemed by the king of Morocco, and the ſultan of the Turks. He at length returned to Leyden, loaded with manuſcripts; and in 1624, ſucceeded Erpinius in the Arabic chair. As he had been an eye-witneſs of the wretched ſtate of Chriſtianity in the Mahometan countries, he was filled with the compaſſion of a fellow-chriſtian; and none ever ſolicited for a place of honour and profit with greater eagerneſs, than he for procuring a new edition of the New Teſtament, in the original language, with a tranſlation into the vulgar Greek, by an Archimandrite; and as there are ſome of theſe Chriſtians who uſe the Arabic tongue in divine ſervice, he alſo took care to have diſperſed among them an Arabic tranſlation of the confeſſion of the Proteſtants, together with the Catechiſm and Liturgy. In 1626, he was alſo choſen profeſſor of mathematics; and diſcharged the functions of both profeſſorſhips with the greateſt applauſe during 40 years. He was likewiſe appointed interpreter in ordinary to the ſtates for the Arabic, Turkiſh, Perſian, and other eaſtern languages, for which he had an annual penſion, and a preſent of a gold chain, with a very beautiful medal, which he wore as a badge of his office. He publiſhed, 1. The life of Tamerlane, written in Arabic. 2. The hiſtory of the Saracens, written by Elmacin. 3. Alferganus's Elements of Aſtronomy, with a new verſion, and learned commentaries. 4. An excellent Arabic lexicon. 5. A Perſian Dictionary. He died in 1667.

Golius, Goltzius.

GOLTZIUS, HENRY, a famous engraver and painter, born in 1558, at Mulbreck in the duchy of Juliers. He was taught the art of engraving by Theodore Cuerenhert; and ſucceeded very wonderfully in it, notwithſtanding the diſadvantage of a lame hand, which was occaſioned by his falling into the fire whilſt young. He was firſt employed by his maſter, and afterwards he worked for Philip Galle. Domeſtic troubles and ill health occaſioned him to travel. He went through Germany into Italy: and paſſed under a feigned name, that his ſtudies might not be interrupted. He viſited Bologna, Florence, Naples, and Venice, conſtantly applying himſelf to drawing from the antique ſtatues, and the works of the great maſters. At Rome he reſided the longeſt; and there he produced ſeveral excellent engravings from Polidoro Raphael, and other eminent painters. On his return to his native country he eſtabliſhed himſelf at Haerlem, where he engraved many of the drawings which he had made during his abode in Italy. He died at Haerlem in 1617, aged 59. He is ſaid to have been 40 years old before he began to paint: yet his pictures are ſpoken of with great commendation; but as he did not produce any great number of them, they are rarely to be met with. As an engraver, he deſerves the higheſt commendation. No man ever ſurpaſſed, and few have equalled, him in the command of the graver and freedom of execution. He copied the ſtyle of Albert Durer, Lucas of Leyden, and other old maſters, with aſtoniſhing exactneſs. Sometimes his engravings are neat in the extreme; at other times they are performed in a bold open manner, without the leaſt reſtraint. He alſo engraved ſeveral of his own deſigns on wood, in that manner which is diſtinguiſhed by the appellation of *chiaro ſcuro*. Of his prints, which are very numerous, it may here ſuffice to ſpecify two or three of the moſt celebrated: 1. Six large upright plates, known by the name of his *maſterpieces*. Theſe, it is ſaid, he engraved to convince the public that he was perfectly capable of imitating the ſtyles of Albert Durer, Lucas Van Leyden, and other maſters, whoſe works were then held in higher eſtimation than his own: for he had adopted a new manner, which he purſued becauſe he thought it ſuperior, and not becauſe he was incapable of following the others. It is reported that with one of them, the Circumciſion, which he ſmoked to give it the more plauſible air of antiquity, he actually deceived ſome of the moſt capital connoiſſeurs of the day; by one of whom it was bought for an original engraving of Albert Durer. The ſubjects of theſe plates are, The Annunciation of the Virgin; the Meeting of the Virgin with Elizabeth, called the Viſitation; the Nativity of Chriſt; the Circumciſion of Chriſt; the Adoration of the Wiſe Men; the Holy Family. 2. The Judgment of Midas, a large plate lengthwiſe. 3. The Venetian Ball, a large plate lengthwiſe, from Theodore Bernard. 4. The Boy and

Goltzius ll Gombroon.

Dog, a middling-ſized upright plate, from a deſign of his own; an admirable print. 5. The Necromancer, a middling-ſized upright oval print, in chiaro-ſcuro. 6. Night in her Chariot, the ſame.

GOMBAULD, JOHN OGIER DE, one of the beſt French poets in the 17th century, and one of the firſt members of the French academy, was born at St Juſt de Luſſac. He acquired the eſteem of Mary de Medicis, and of the wits of his time. He was a Proteſtant, and died in a very advanced age. He wrote many works in verſe and proſe. His epigrams, and ſome of his ſonnets, are particularly eſteemed.

GOMBROON, by the natives called *Bander Abaſſi*, a city of Perſia, ſituated in N. Lat. 27. 20. E. Long. 55. 40. The name of *Gombroon*, or *Comerong*, Captain Hamilton tells us, it had from the Portugueſe; becauſe it was remarkable for the number of prawns and ſhrimps caught on its coaſts, by them called *comerong*. This city owes its wealth and grandeur to the demolition of Ormus, and the downfal of the Portugueſe empire in the Eaſt Indies. It is now juſtly accounted one of the greateſt marts in the Eaſt, was built by the great Shah Abas, and from him, as ſome think, obtained the name of *Bander Abaſſi*, which ſignifies the court of Abas. It ſtands on a bay about nine leagues to the northward of the eaſt end of the iſland of Kiſhmiſh, and three leagues from the famous Ormus. The Engliſh began to ſettle here about the year 1631, when, in conſideration of their ſervices againſt the Portugueſe, Shah Abas granted them half the cuſtoms of that port. This was confirmed by a phirmaund, and duly regarded, till the Engliſh began to neglect the ſervices they had ſtipulated. Whether the company has any emolument from the cuſtoms at preſent, is what we cannot pretend to aſcertain. The town is large, but its ſituation bad; wanting almoſt every thing that contributes to the happineſs and even ſupport of life. Towards the land it is encompaſſed by a ſort of wall; and towards the ſea are ſeveral ſmall forts with a platform, and a caſtle or citadel, mounted with cannon to ſecure it and the road from the attempts of an enemy by ſea. The houſes in moſt of the ſtreets are ſo out of repair, ſome half down, others in a heap of rubbiſh, that a ſtranger would imagine the town had been ſacked and ravaged by a barbarous people; not a veſtige of the wealth really contained in the place appearing in view. The bazars and ſhops round them are kept, for the moſt part, by Banians, whoſe houſes are generally in good order. Moſt of the houſes are built with earth and lime, but ſome of the beſt with ſtone. Many of them have a ſort of ventilators at top, which contributes greatly to the health of the inhabitants in the hot ſeaſons of the year. The moſt ſickly months here are April, May, September, and October. With fiſh and mutton the inhabitants are well ſupplied. Rice is imported from India; and wheat is ſo plenty, that the poor ſubſiſt chiefly on bread and dates. The country hereabouts abounds in the moſt delicious fruits, as apricots, peaches, pomegranates, pears, mangoes, grapes, quavas, plums, ſweet quinces, and water melons. The apricots, however, are ſmall, and extremely dangerous if eaten to exceſs.

Thoſe conveniences are more than overbalanced by the ſcarcity of freſh water, with which the inhabitants are ſupplied from Aſſeen, a place ſeven miles diſtant, there not being a ſpring or well in the town. Perſons of condition keep a camel conſtantly employed in bringing freſh and wholeſome water. Captain Hamilton gives it as his opinion, that one cauſe of the unwholeſomeneſs of this city is the reflection of the rays of light from a high mountain to the north of it. He ſays, that when the beams are reflected from this mountain, they almoſt fire the air, and, for two or three months in the year, render the ſituation intolerable. For this reaſon the people of condition retire into the country, to paſs the heats of June, July, and Auguſt. The very ſea, during this ſeaſon, is affected, inſomuch that the ſtench is no leſs diſagreeable than that of putrid carcaſes; and this is increaſed by the quantities of ſhell fiſh left on the ſhore, from which an exhalation ariſes that tarniſhes gold and ſilver, and is leſs tolerable than the bilge-water of a tight ſhip. At Aſſeen the Engliſh factory have a country houſe and gardens, to which they retire occaſionally. Here they have whole groves of Seville orange trees, which, though not natural to the country, thrive very well, and are always verdant, bearing ripe and green fruit, with bloſſoms, all at the ſame time. They have likewiſe tanks and ponds of fine freſh water, with every thing elſe that can moderate the heat of the climate, and render life agreeable and elegant. About 10 miles from Aſſeen is a place called *Minoa*, where are cold and hot natural baths, reckoned infallible in the cure of all ſcrophulous diſorders, rheumatiſms, and other diſeaſes, by bathing. Gombroon Gomera.

Gombroon is extremely populous, on account of the commerce carried on by the Dutch and Engliſh factories, as well as the natives. The Engliſh factory is cloſe by the ſea, at ſome diſtance from the Dutch, which is a commodious and fine new building. A great part of the company's profits ariſes from freights. As the natives have not one good ſhip of their own, and are extremely ignorant of navigation, they freight their goods for Surat, and other Indian marts, in Engliſh and Dutch bottoms, at an exorbitant rate. The commodities of the Gombroon market are, fine wines of different kinds, raiſins, almonds, kiſh-miſhes, prunellas, dates, piſtachio-nuts, ginger, ſilks, carpets, leather, tutty, galbanum, ammoniac, aſſafœtida, tragacanth, with other gums, and a variety of ſhop medicines. Theſe are in a great meaſure the produce of Carmania, which they bring to Gombroon in caravans. The Engliſh company had once a ſmall factory in the province of Carmania, chiefly for the ſake of a fine wool produced there, and uſed by the hatters. The ſaid company had once a project of carrying a breed of the Perſian goats to St Helena; but whether it was executed, or what ſucceſs it met with, we cannot ſay. Although the company pay no cuſtoms, yet they uſually make a preſent to the ſhabander, to avoid the trouble he has it in his power to give them. All private traders with the company's paſſes, enjoy the ſame privileges, on paying two per cent. to the company, one to the agent, and one to the broker. All private trade, either by European or country ſhips, has long been engroſſed by the company's ſervants.

GOMERA, one of the Canary iſlands, lying between Ferro and Teneriffe. It has one good town of the ſame name, with an excellent harbour, where the Spaniſh

Gomera || Gondar.

Spaniſh fleet often taken in refreſhments. They have corn ſufficient to ſupply the inhabitants, with one ſugar-work, and great plenty of wine and fruits. It is ſubject to the Spaniards, who conquered it in 1445. W. Long. 17. 10. N. Lat. 28. 0.

GOMORRAH, in *Ancient Geography*, one of the cities of the plain or of the vale of Siddim in Judæa, deſtroyed together with Sodom by fire from heaven, on account of the wickedneſs of the people. To determine its particular ſituation at preſent is impoſſible.

GOMOZIA, a genus of plants belonging to the tetrandria claſs. See BOTANY *Index*.

GOMPHOSIS, in *Anatomy*, that kind of articulation by which the teeth are fixed in the jaw-bone. See ANATOMY, N° 2.

GOMPHRÆNA, GLOBE AMARANTH; a genus of plants belonging to the pentandria claſs; and in the natural method ranking under the 54th order, *Miſcellaneæ*. See BOTANY *Index*.

GONAQUA, the name of a nation inhabiting about the Cape, and ſuppoſed by Dr Sparrman to be a mixture of Hottentots and Caffres. See HOTTENTOTS.

GONDAR, the capital of Abyſſinia; ſituated, according to Mr Bruce's obſervations, in latitude 12. 30. north, and longitude 37. 40. eaſt from Greenwich. It lies upon the top of a hill of conſiderable height, and conſiſts of about 10,000 families in times of peace. The houſes are chiefly of clay, with roofs thatched in the form of cones. At the weſt end of the town is the king's palace; formerly, as Mr Bruce informs us, a ſtructure of conſiderable conſequence, being a large ſquare building four ſtories high, flanked with ſquare towers, and affording from the top of it a magnificent view of all the country ſouthward to the lake Tzana. It was built in the time of Facilidas, by maſons from India, and by ſuch Abyſſinians as had been inſtructed in architecture by the Jeſuits before their expulſion. Great part of it is now in ruins, having been burnt at different times; but there is ſtill ample lodging in the two loweſt floors, the audience chamber being above 120 feet long. By the ſide of this ſtructure there have been built by different kings apartments of clay only, in the faſhion of their own country. The palace, with all its contiguous buildings, is ſurrounded by a double ſtone wall thirty feet high and a mile and a half in circumference, with battlements upon the outer wall, and a parapet roof between the outer and inner, by which you can go along the whole and look into the ſtreet. The hill on which the town is built riſes in the middle of a deep valley, through which run two rivers: one of which, the Kakha, coming from the Mountain of the Sun, flanks all the ſouth of the town; while the other, called the *Angrab*, falling from the mountain Woggora, encompaſſes it on the north and north-eaſt; and both rivers unite at the bottom of the hill about a quarter of a mile ſouth of the town. Upon the bank oppoſite to Gondar, on the other ſide of the river, is a large town of Mahometans; a great part of whom are employed in taking care of the king's and nobility's equipage, both when they take the field and when they return from it. They are formed into a body under proper officers; but never fight on either ſide, being entirely confined to the occupation juſt mentioned, in which by their care and dexterity in pitching and ſtriking the tents, and in leading and conducting the baggage-waggons, they are of great ſervice.—The valley of Gondar is deſcribed as having three outlets; one ſouth, to Dembea, Maitſha, and the Agows; another on the north-weſt, towards Sennaar, from which it is diſtant 180 miles, over the Mountain of the Sun; and the third north, leading to Woggora, over the high mountain Lamalmon, and ſo on through Tigre to the Red ſea.

Gondar || Goniometry.

GONDI, JOHN FRANCIS PAUL, Cardinal de Retz, was the ſon of Philip Emanuel de Gondi, Count de Joigny, lieutenant-general, &c. and was born in 1613. From a doctor of the Sorbonne, he firſt became coadjutor to his uncle John Francis de Gondi, whom he ſucceeded in 1654 as archbiſhop of Paris; and was finally made a cardinal. This extraordinary perſon has drawn his own character in his memoirs with impartiality. He was a man who, from the greateſt degree of debauchery, and ſtill languiſhing under its conſequences, made himſelf adored by the people as a preacher. At the age of 23, he was at the head of a conſpiracy againſt the life of Cardinal Richelieu; he precipitated the parliament into cabals, and the people into ſedition: he was (ſays M. Voltaire) the firſt biſhop who carried on a civil war without the maſk of religion. However, his intrigues and ſchemes turned out ſo ill, that he was obliged to quit France; and he lived the life of a vagrant exile for five or ſix years, till the death of his great enemy Cardinal Mazarin, when he returned on certain ſtipulated conditions. After aſſiſting in the conclave at Rome, which choſe Clement IX. he retired from the world, and ended his life like a philoſopher in 1679; which made Voltaire ſay, that in his youth he lived like Catiline, and like Atticus in his old age. He wrote his Memoirs in his retirement; the beſt edition of which is that of Amſterdam, 4 vols 12mo, 1719.

GONDOLA, a flat boat, very long and narrow, chiefly uſed at Venice to row on the canals. The word is Italian, *gondola*. Du Cange derives it from the vulgar Greek κουνδελας, "a bark," or "little ſhip;" Lancelot deduces it from γονδυ, a term in Athenæus for a ſort of vaſe.

The middle-ſized gondolas are upwards of thirty feet long and four broad: they always terminate at each end in a very ſharp point, which is raiſed perpendicularly to the full height of a man.

The addreſs of the Venetian gondoliers, in paſſing along their narrow canals, is very remarkable: there are uſually two to each gondola, and they row by puſhing before them. The fore-man reſts his oar on the left ſide of the gondola: the hind-man is placed on the ſtern, that he may ſee the head over the tilt or covering of the gondola, and reſts his oar, which is very long, on the right ſide of the gondola.

GONDOLA is alſo the name of a paſſage-boat of ſix or eight oars, uſed in other parts of the coaſt of Italy.

GONIOMETRY, a method of meaſuring angles, ſo called by M. de Lagny, who gave ſeveral papers, on this method, in the Memoirs of the Royal Academy an. 1724, 1725, 1729. M. de Lagny's method of goniometry conſiſts in meaſuring the angles with a pair of compaſſes, and that without any ſcale whatever, except an undivided ſemicircle. Thus, having any angle drawn

Goniometry || Good.

drawn upon paper, to be meaſured; produce one of the ſides of the angle backwards behind the angular point; then with a pair of fine compaſſes deſcribe a pretty large ſemicircle from the angular point as a centre, cutting the ſides of the propoſed angle, which will intercept a part of the ſemicircle. Take then this intercepted part very exactly between the points of the compaſſes, and turn them ſucceſſively over upon the arc of the ſemicircle, to find how often it is contained in it, after which there is commonly ſome remainder: then take this remainder in the compaſſes, and in like manner find how often it is contained in the laſt of the integral parts of the firſt arc, with again ſome remainder: find in like manner how often this laſt remainder is contained in the former; and ſo on continually, till the remainder become too ſmall to be taken and applied as a meaſure. By this means he obtains a ſeries of quotients, or fractional parts, one of another, which being properly reduced into one fraction, give the ratio of the firſt arc to the ſemicircle, or of the propoſed angle to two right angles, or 180 degrees, and conſequently that angle itſelf in degrees and minutes. *Hutton's Math. Dict.*

GONORRHOEA, an efflux of white, greeniſh, or differently-coloured matter, from the urethra; moſt commonly owing to venereal infection. See MEDICINE and SURGERY *Index*.

GONZAGA, LUCRETIA, was one of the moſt illuſtrious ladies of the 16th century; and much celebrated for her wit, her learning, and her delicate ſtyle. Hortenſio Lando wrote a beautiful panegyric upon her, and dedicated to her his dialogue of moderating the paſſions. Her beautiful letters have been collected with the greateſt care. We learn from theſe, that her marriage with John Paul Manfrone was unhappy.—She was married when ſhe was not 14 years of age, and his conduct afterwards gave her infinite uneaſineſs. He engaged in a conſpiracy againſt the duke of Ferrara; was detected and impriſoned by him; but, though condemned by the judges, not put to death. She did all in her power to obtain his enlargement, but in vain; for he died in priſon, having ſhown ſuch impatience under his misfortunes, as made it imagined he had loſt his ſenſes. She never would liſten afterwards to any propoſals of marriage, though ſeveral were made to her. All that came from her pen was ſo much eſteemed, that a collection was made even of the notes ſhe writ to her ſervants; ſeveral of which are to be met with in the edition of her letters.

GOOD, in general, whatever is apt to increaſe pleaſure, to diminiſh pain in us; or, which amounts to the ſame, whatever is able to procure or preſerve to us the poſſeſſion of agreeable ſenſations, and remove thoſe of an oppoſite nature.

Moral GOOD, denotes the right conduct of the ſeveral ſenſes and paſſions, or their juſt proportion and accommodation to their reſpective objects and relations. See MORALS.

GOOD *Abearing* (*bonus geſtus*), ſignifies an exact carriage or behaviour of a ſubject towards the king and the people, whereunto ſome perſons upon their miſbehaviour are bound: and he that is bound to this, is ſaid to be more ſtrictly bound than to the peace: becauſe where the peace is not broken, the ſurety *de bono geſtu* may be forfeited by the number of a man's company, or by their weapons.

Good, Good Hope.

GOOD Behaviour, in *Law*, an exact carriage and behaviour to the king and his people.

A juſtice of the peace may, at the requeſt of another, or where he himſelf ſees cauſe, demand ſurety for the good behaviour; and to that end the juſtice may iſſue out his warrant againſt any perſons whatſoever, under the degree of nobility; but when it is a nobleman, complaint is to be made in the court of chancery, or king's bench, where ſuch nobleman may be bound to keep the peace. Infants and feme-coverts, who ought to find ſurety by their friends, may be bound over to their good behaviour; as alſo lunatics, that have ſometimes lucid intervals, and all others who break the peace, or being ſuſpected to do it by affrays, aſſaults, battery, wounding, fighting, quarrelling, threatening, &c. A perſon may be likewiſe bound to his good behaviour for a ſcandalous way of living, keeping bawdy-houſes, gaming-houſes, &c. and ſo may common drunkards, whoremongers, common whores, cheats, libellers, &c. He who demands ſurety for the peace, on any violence offered, muſt take an oath before the juſtice, that he goes in fear of his life, or ſome bodily harm, &c. and that it is not out of malice, but from a regard to his own ſafety.

GOOD Breeding. See *Good MANNERS*.

GOOD Friday, a faſt of the Chriſtian church, in memory of the ſufferings and death of Jeſus Chriſt. It is obſerved on the Friday in *holy* or *paſſion week*; and it is called, by way of eminence, *good*, becauſe of the bleſſed effects of our Saviour's ſufferings, which were a propitiatory or expiating ſacrifice for the ſins of the world. The commemoration of our Saviour's ſufferings has been kept from the very firſt ages of Chriſtianity, and was always obſerved as a day of the ſtricteſt faſting and humiliation. Among the Saxons it was called *Long-Friday*; but for what reaſon, except on account of the long faſtings and offices then uſed, is uncertain. On Good Friday the pope ſits on a plain form: and, after ſervice is ended, when the cardinals wait on him back to his chamber, they are obliged to keep a deep ſilence, as a teſtimony of their ſorrow. In the night of Good-Friday, the Greeks perform the obſequies of our Saviour round a great crucifix, laid on a bed of ſtate, adorned with flowers; theſe the biſhops diſtribute among the aſſiſtants when the office is ended. The Armenians, on this day, ſet open a holy ſepulchre, in imitation of that of Mount Calvary.

GOOD Hope, or *Cape of Good Hope*, a promontory of Africa, where the Dutch have built a good town and fort. It is ſituated in the country of the Hottentots: for an account of whom, and of the country at large, with its firſt diſcovery, ſee the article HOTTENTOTS.

The Cape of Good Hope has been generally eſteemed the moſt ſoutherly point of Africa, though it is not truly ſo. In *Phillips's Voyage to Botany Bay* *, we are told, that the land which projects fartheſt to the ſouth is a point to the eaſt of it, called by the Engliſh *Cape Lagullus*; a name corrupted from the original Portugueſe *das Agulhas*, which, as well as the French appellation *des Aiguilles*, is deſcriptive of its form, and would rightly be tranſlated *Needle cape*.

* P. 38.

On approaching the cape, a very remarkable emi-

nence

Good Hope. nence may in clear weather be diſcovered at a conſiderable diſtance; and is called the *Table-mountain* from its appearance, as it terminates in a flat horizontal ſurface, from which the face of the rock deſcends almoſt perpendicularly. In the mild or ſummer ſeaſon, which commences in September, and continues till March, the Table Land or Mountain, is ſometimes ſuddenly capped with a white cloud, by ſome called the *ſpreading of the Table-cloth*. When this cloud ſeems to roll down the ſteep face of the mountain, it is a ſure indication of an approaching gale of wind from the ſouth-eaſt; which generally blows with great violence, and ſometimes continues a day or more, but in common is of ſhort duration. On the firſt appearance of this cloud, the ſhips in Table Bay begin to prepare for it, by ſtriking yards and top-maſts, and making every thing as ſnug as poſſible.—A little to the weſtward of the Table Land, divided by a ſmall valley, ſtands on the right-hand ſide of Table Bay a round hill, called the *Sugar Loaf*; and by many the *Lion's Head*, as there is a continuance from it contiguous to the ſea, called the *Lion's Rump*; and when you take a general view of the whole, it very much reſembles that animal with his head erect. The Sugar Loaf or Lion's Head, and the Lion's Rump, have each a flag ſtaff on them, by which the approach of ſhips is made known to the governor, particularizing their number, nation, and the quarter from which they come. To the eaſtwards, ſeparated by a ſmall chaſm from the Table Land, ſtands Charles's Mount, well known by the appellation of the *Devil's Tower*, or *Devil's Head*; and ſo called from the violent guſts of wind ſuppoſed to iſſue from it when it partakes of the cap that covers the Table Land, though theſe guſts are nothing more than a degree of force the wind acquires in coming through the chaſm. When this phenomenon appears in the morning, which is by no means ſo frequent as in the evening, the ſailors have a ſaying, as the Devil's Tower is almoſt contiguous to the Table Land, that the old gentleman is going to breakfaſt; if in the middle of the day, that he is going to dinner; and if in the evening, that the cloth is ſpread for ſupper. Table-mountain riſes about 3567 feet above the level of the ſea; the Devil's Tower, about 3368; and the Lion's Head, 2764. In the neighbourhood of the latter lies *Conſtantia*, a diſtrict conſiſting of two farms, wherein the famous wines of that name are produced

The above-deſcribed high lands form a kind of amphitheatre about the Table-valley, where the Cape-town ſtands. This is ſituated at the bottom of the middle height, or Table mountain; and almoſt in the centre of the Table Bay, ſo called from that mountain.—This bay, it is obſerved in Phillips's Voyage, "cannot properly be called a port, being by no means a ſtation of ſecurity; it is expoſed to all the violence of the winds which ſet into it from the ſea; and is far from ſufficiently ſecured from thoſe which blow from the land. The guſts which deſcend from the ſummit of Table-mountain are ſufficient to force ſhips from their anchors, and even violently to annoy perſons on the ſhore, by deſtroying any tents or other temporary edifices, which may be erected, and raiſing clouds of fine duſt, which produce very troubleſome effects. A gale of this kind, from the ſouth-eaſt, blew for three days ſucceſſively when Captain Cook lay here in his firſt voyage; at which time, he informs us, the Reſolution was the only ſhip in the harbour that had not dragged her anchor. The ſtorms from the ſea are ſtill more formidable; ſo much ſo, that ſhips have frequently been driven by them from their anchorage, and wrecked at the head of the bay. But theſe accidents happen chiefly in the *quaade mouſſon*, or winter months, from May 14th to the ſame day of Auguſt; during which time few ſhips venture to anchor here. Our fleet arriving later, lay perfectly unmoleſted as long as it was neceſſary for it to remain in this ſtation. —Falſe Bay, on the ſouth-eaſt ſide of the Cape, is more ſecure than Table Bay during the prevalence of the north-weſt winds, but ſtill leſs ſo in ſtrong gales from the ſouth-eaſt. It is, however, leſs frequented, being 24 miles of very heavy road diſtant from Cape Town, whence almoſt all neceſſaries muſt be procured. The moſt ſheltered part of Falſe Bay is a receſs on the weſt ſide, called *Simon's Bay*." Good Hope.

Mr White, in his Journal of a Voyage to New South Wales, thus deſcribes Cape Town. From the ſhipping, he obſerves *, the town appears pleaſantly ſituated, but at the ſame time ſmall; a deception that ariſes from its being built in a valley with ſuch ſtupendous mountains directly behind it. On landing, however, you are ſurpriſed, and agreeably diſappointed, to find it not only extenſive, but well built, and in a good ſtyle; the ſtreets ſpacious, and interſecting each other at right angles with great preciſion. This exactneſs in the formation of the ſtreets, when viewed from the Table Land, is obſerved to be very great. The houſes in general are built of ſtone, cemented together with a glutinous kind of earth which ſerves as mortar, and afterwards neatly plaſtered and whitewaſhed with lime. As to their height they do not in common exceed two ſtories, on account of the violence of the wind, which at ſome ſeaſons of the year blows with great ſtrength and fury. For the ſame reaſon thatch has been uſually preferred to tiles or ſhingles; but the bad effects that have proceeded from this mode when fires happen, has induced the inhabitants in all their new buildings to give the preference to ſlates and tiles. The lower parts of the houſes, according to the cuſtom of the Dutch nation, are not only uncommonly neat and clean in appearance, but they are really ſo; and the furniture is rather rich than elegant. But this is by no means the caſe with the bedrooms or upper apartments; which are very barely and ill furniſhed. The ſtreets are rough, uneven, and unpaved. But many of the houſes have a ſpace flagged before the door; and others have trees planted before them, which form a pleaſant ſhade, and give an agreeable air to the ſtreets. * Page 87

The only landing-place is at the eaſt end of the town, where there is a wooden quay running ſome paces into the ſea, with ſeveral cranes on it for the convenience of loading and unloading the ſcoots that come alongſide. To this place excellent water is conveyed by pipes, which makes the watering of ſhips both eaſy and expeditious. Cloſe to the quay, on the left hand, ſtands the caſtle and principal fortreſs; a ſtrong extenſive work, having excellent accommodations for the troops, and for many of the civil officers belonging to the company. Within the gates, the company have their principal ſtores; which are ſpacious as well as convenient. This fort covers and defends the eaſt part of the town and harbour

Good Hope. bour, as Amſterdam fort does the weſt part. The latter, which has been built ſince Commodore Johnſton's expedition, and whereon both French and Dutch judgment have been united to render it effectual and ſtrong, is admirably planned and calculated to annoy and haraſs ſhips coming into the bay. Some ſmaller detached fortifications extend along the coaſt, both to the eaſt and weſt, and make landing, which was not the caſe before the late war, hazardous and difficult. In a word, Cape Town is at this time fortified with ſtrength, regularity, and judgment.

The governor's houſe is delightfully ſituated, nearly in the centre of an extenſive garden, the property of the Dutch Eaſt India company, uſefully planted, and at the ſame time elegantly laid out. The governor's family make what uſe they pleaſe of the produce of the garden, which is various and abundant; but the original intention of the company in appropriating ſo extenſive a piece of ground to this purpoſe was, that their hoſpital, which is generally pretty full when their ſhips arrive after long voyages, may be well ſupplied with fruits and vegetables, and likewiſe that their ſhips may receive a ſimilar ſupply. This garden is as public as St James's park; and for its handſome, pleaſant, and well-ſhaded walks, is much frequented by perſons of every deſcription, but particularly by the faſhionable and gay. At the upper end of the principal walk is a ſmall ſpace walled in for the purpoſe of confining ſome large oſtriches and a few deer; and a little to the right of this is a ſmall menagery, in which the company have half a dozen wild animals, and about the ſame number of curious birds.

There are two churches in the town; one large, plain, and unadorned, for the Calviniſts, the prevailing ſect; and a ſmaller one for the Lutherans. The hoſpital, which is large and extenſive, is ſituated at the upper end of the town, cloſe to the company's garden; where the convaleſcents reap the benefit of a wholeſome pure air, perfumed with the exhalations of a great variety of rich fruit trees, aromatic ſhrubs, and odorous plants and flowers; and likewiſe have the uſe of every production of it.

Beſides their hoſpital, the Dutch Eaſt India company have ſeveral other public buildings, which tend to improve the appearance of the town. The two principal of theſe are, the ſtables and a houſe for their ſlaves. The former is a handſome range of buildings, capable of containing an incredible number of horſes. Thoſe they have at the Cape are ſmall, ſpirited, and full of life. The latter is a building of conſiderable extent, where the ſlaves, both male and female, have ſeparate apartments, in a very comfortable ſtyle, to reſide in after the fatigues and toil of the day; and there are ſeveral officers placed over them, who have commodious apartments, and treat them humanely.

The inhabitants of the Cape, though in their perſons large, ſtout, and athletic, have not all that phlegm about them which is the characteriſtic of Dutchmen in general. The phyſical influence of climate may in ſome degree account for this; for it is well known that in all ſouthern latitudes the temper and diſpoſition of the people are more gay, and that they are more inclined to luxury and amuſements of every kind, than the inhabitants of the northern hemiſphere. The ladies are lively, good natured, and familiar; and from a peculiar gay turn, they admit of liberties that would be thought reprehenſible in England, though perhaps they as ſeldom overleap the bounds of virtue as the women of other countries. Good Hope.

The heavy draft work about the Cape is moſtly performed by oxen; which are here brought to an uncommon degree of uſefulneſs and docility. It is not uncommon to ſee 14, 16, and ſometimes 18, in one of their teams; when the roads are heavy, they ſometimes, though rarely, yoke 20; all which the Hottentots, Malays, and Cape ſlaves, have in the moſt perfect ſubjection and obedience. One of theſe fellows places himſelf on the fore part of the waggon, or, when loaded, on the top of the load, and with a tremendous long whip, which from its ſize he is obliged to hold in both his hands, manages theſe creatures with inexpreſſible addreſs. When he finds expedition needful, he can make them keep whatever pace he chooſes, either trot or gallop, (a gait performed or kept up with difficulty by European oxen), and that with as much eaſe as if he was driving horſes. They likewiſe manage horſes with the ſame dexterity; and to ſee one of them driving three, four, five, and ſometimes ſix pair, in hand, with one of theſe long whips, would make the moſt complete maſter of the whip in England cut a deſpicable figure. Carriages are not very numerous at the Cape, as the inhabitants in general travel in covered waggons, which better ſuit the roughneſs of the country. The governor and ſome few of the principal people keep coaches, which are a good deal in the Engliſh ſtyle, and always drawn by ſix horſes.

The Cape of Good Hope was taken by the Britiſh on 17th Auguſt 1796, with little or no difficulty, and afterwards given up at the peace of 1801. It has been ſince retaken, and is at preſent (1806) in the poſſeſſion of the Britiſh.

When the news of the capture of this important ſettlement reached England, it was conſidered as of incalculable value to the Eaſt India Company in particular, forming a barrier or grand outwork to their immenſe poſſeſſions in India. They obtained the unconditional grant of ſupplying the Cape with India and China goods, and care was taken to defeat every attempt that could be made to undermine their intereſt. Aware of its great importance, it was the reſolution of miniſtry, "that no foreign power, directly or indirectly, ſhould obtain poſſeſſion of the Cape of Good Hope, for that it was the phyſical guarantee of the Britiſh territories in India." While all were convinced of its political importance, none diſputed its commercial advantages.

Its geographical poſition on the globe is ſo commanding a feature, that the mere looking at a map, independent of any other information, muſt ſhew its value and importance in various reſpects. Its diſtance from the coaſt of Brazil is a month's voyage; from the Dutch colonies of Surinam, Berbice, and Eſſequibo, it is a voyaye of ſix weeks; it is about equally diſtant from the Red ſea, and two months from Coromandel and Malabar. It is half way between Britain and India, in a temperate climate, and productive of every ſpecies of refreſhment in great abundance.

Conſidered in the light of a naval ſtation, the importance of the Cape is equally conſpicuous. It may ſerve as a port for refreſhing and refitting the ſhips of

Good Hope. the East India Company; a station for ships of war keeping the entrance into the Indian seas, and affording by its geographical position, a ready communication with every part of the globe. There is no place, in the homeward bound voyage from India, so proper or convenient for the valuable fleets of the East India Company, to assemble at for convoy, as the Cape of Good Hope. Their crews might be refreshed with fruits, vegetables, and fresh provisions, at a very reasonable rate. Salt beef for the remainder of the voyage might there be laid in. An establishment for curing salt provisions, would be an incalculable saving to the Company, as well as a singular convenience. The moderate expence at which a fleet could here be maintained, is a circumstance that deserves attention. At the Cape a sailor may be furnished his ration of fresh beef or mutton, biscuit and wine, for one-fourth of what the same ration of salt beef costs the government when sent out from Britain. He can have a pint of wine for threepence, and were it not for the monopoly of that article, he might purchase it for half the sum.

If a naval establishment was formed at Saldanha bay, many coasting vessels and fishing ships would be constructed in it, as it abounds with every convenience that could be required for building ships, which would be the means of very much increasing the coasting trade.

To what extent the Cape might have been rendered advantageous to the British empire as an emporium of eastern produce, as furnishing articles of export for consumption in Europe and the West Indies, and taking articles of British growth and manufacture in exchange for colonial produce, it may be proper to enquire. The chief objection against this use of the Cape is the prejudice it would occasion to the sales of Leadenhall street, and the diminution of his majesty's customs; for though the East India Company might be made responsible to the crown for the duties on the amount of its sales at the Cape, yet the intention of the emporium would be entirely defeated, if the duties demanded there so far enhanced the value of the Indian commodities, as to make it equally eligible for foreign shipping to proceed to India, or to resort to the London market. The East India Company could supply their emporium at the Cape with the produce and manufacture of Great Britain to any amount, and at so cheap a rate as to undersell any other nation.

Should the Cape become a commercial depot in the hands of the East India Company, the consumption in Spanish and Portuguese America, of eastern produce, would increase to a very great extent, for all which they would pay in specie, of which the Company stand in the greatest need for their China trade.

A new branch of traffic might be opened between the Cape and New South Wales, the latter supplying the former with coals, of which they have abundant mines, in exchange for cattle, butter, wine, and articles of clothing.

The Cape may also be considered as of advantage to the British nation, by furnishing articles of export for general consumption in Europe and the West Indies. These are grain and pulse, wine and brandy, wool, hides and skins, whale oil and bone, dried fruits, salt provisions, soap and candles, aloes, ivory, and tobacco.

Were a depot for the southern whale fishery established at the Cape, it might be attended with beneficial consequences. By promoting navigation, the strength and security of the British empire are also promoted, and its very existence as an independent nation is owing to the superiority of its navy. A nation of fishermen implies a nation of seamen, a race of bold and hardy warriors. The cultivation of the fisheries would afford a never-failing supply of men so instructed, increase our conveniency, and promote our commerce. Good Hope || Gordianus.

The colony of the Cape comprehends at least 120,000 square miles, yet the whole population of whites, blacks, and Hottentots, does not exceed 60,000 souls, or a single individual for every two square miles. The upper regions of the mountains are masses of sandstone, and where the waters break out in springs upon the surface of the plains, vegetation is very luxuriant. In the vicinity of the Cape, where the soil is coloured with iron, or oxide of iron combined with clay, the most luxuriant crops of grapes are produced. The climate in general is friendly to vegetation, but being within the influence of the periodical winds, the rains are very unequal.

The chief rivers on the south coast are the Gauritz, Knysna, Keurboom, Camtoos, Zwartkops, Sunday, and Great Fish rivers, and the two principal rivers on the western coast are the Berg, or mountain river, and the Oliphant river, which falls into the Southern Atlantic in 31° 30′ S. Lat.*.

* *Barrow's Travels in Africa*, vol. ii.

Good Manners. See Manners.

GOOINGS, in sea-language, are clamps of iron bolted on the stern-post of a ship, whereon to hang the rudder and keep it steady; for which purpose there is a hole in each of them, to receive a correspondent spindle bolted on the back of the rudder, which turns thereby as upon hinges.

GOOSE. See Anas, Ornithology *Index*. The goose was held in great esteem amongst the Romans, for having saved the Capitol from the invasion of the Gauls by cackling and clapping its wings. Geese were kept in the temple of Juno; and the censors, when they entered upon their office, provided meat for them. There was also an annual feast at Rome, at which they carried a silver image of a goose in state; and hanged a dog, to punish that animal because he did not bark at the arrival of the Gauls.

Goose-Ander. See Mergus, Ornithology *Index*.

Goose-Berry. See Ribes, Botany *Index*.

Goose-Neck, in a ship, a piece of iron fixed on the one end of the tiller, to which the laniard of the whip-staff or the wheel-rope comes, for steering the ship.

Goose-Wing, in the sea language. When a ship sails before, or with a quarter-wind on a fresh gale, to make the more haste, they launch out a boom and sail on the lee-side; and a sail so fitted is called a *goose-wing*.

GORCUM, a town in South Holland, which carries on a considerable trade in cheese and butter. It is situated on the rivers Ligne and Maese, in E. Long. 4. 55. N. Lat. 51. 49.

GORDIANUS I. a Roman general, was for his valour and virtues chosen emperor by the army in the reign of Maximinus, A. D. 237; but his son, whom he had associated with himself in the throne, being slain by Capellian, the governor of Mauritania for Maximinus,

Gordianus Maximinus, Gordianus killed himſelf the ſame year. See ROME.

Gordianus ‖ Gordon.

GORDIANUS III. grandſon of the former, a renowned warrior, and ſtyled *The guardian of the Roman commonwealth.* He was treacherouſly aſſaſſinated by Philippus, an Arabian, one of his generals; who, to the eternal diſgrace of the Romans of that era, ſucceeded him in the empire, A. D. 244. See ROME.

GORDIAN-KNOT, in antiquity, a knot made in the leathers or harneſs of the chariot of Gordius king of Phrygia, ſo very intricate, that there was no finding where it began or ended. The inhabitants had a tradition, that the oracle had declared, that he who untied this knot ſhould be maſter of Aſia. Alexander having undertaken it, was unable to accompliſh it; when fearing leſt his not untying it ſhould be deemed an ill augury, and prove a check in the way of his conqueſts, he cut it aſunder with his ſword, and thus either accompliſhed or eluded the oracle.

GORDIUS, the HAIR-WORM, a genus of inſects belonging to the claſs of *vermes inteſtina.* See HELMINTHOLOGY *Index.*

GORDIUS, king of Phrygia, and father of Midas, was a poor huſbandman, with two yokes of oxen, wherewith he ploughed his land and drew his wain. An eagle ſitting a long while upon one of his oxen, he conſulted the ſoothſayers; a virgin bid him ſacrifice to Jupiter in the capacity of king. He married the virgin, who brought forth Midas. The Perſians inſtructed by the oracle to ſet the firſt perſon they met in a wain upon the throne, met Gordius, and made him king. Midas for this good fortune dedicated to Jupiter his father's cart. The knot of the yoke, they ſay, was ſo well twiſted, that he who could unlooſe it was promiſed the empire of Aſia; hence the proverb of *the Gordian knot* had its original. See *GORDIAN KNOT.*

GORDON, ALEXANDER, an excellent draughtſman, and a good Greek ſcholar, who reſided many years in Italy, viſited moſt parts of that country, and had alſo travelled into France, Germany, &c. was ſecretary to the Society for Encouragement of Learning; and afterwards to the Egyptian Club, compoſed of gentlemen who had viſited Egypt viz. Lord Sandwich, Dr Shaw, Dr Pococke, &c. He ſucceeded Dr Stukeley as ſecretary to the Antiquarian Society, which office he reſigned in 1741 to Mr Joſeph Ames. He went to Carolina with Governor Glen, where, beſides a grant of land, he had ſeveral offices, ſuch as regiſter of the province, &c.; and died a juſtice of the peace, leaving a handſome eſtate to his family. He publiſhed, 1. *Itinerarium Septentrionale*, or a Journey through moſt parts of the Counties of Scotland, in two parts, with 66 copperplates, 1726, folio. 2. Supplement to the *Itinerarium*, 1732, folio. 3. The Lives of Pope Alexander VI. and his ſon Cæſar Borgia. 4. A complete Hiſtory of the Ancient Amphitheatres, 1730, 8vo. afterwards enlarged in a ſecond edition. 5. An Eſſay towards explaining the hieroglyphical figures on the Coffin of the ancient Mummy belonging to Capt. William Lethieuller, 1737, folio, with cuts. 6. Twenty-five Plates of all the Egyptian Mummies and other Egyptian Antiquities in England, 1739, folio.

GORDON, *Thomas*, noted for his tranſlations and political writings, was born at Kirkcudbright in North Britain. He came young to London; where he ſupported himſelf by teaching languages, until he procured employment under the earl of Oxford in Queen Anne's time, but in what capacity is not now known. He firſt diſtinguiſhed himſelf in the defence of Dr Hoadley in the Bangorian controverſy; which recommended him to Mr Trenchard, in conjunction with whom he wrote the well-known Cato's Letters, upon a variety of important public ſubjects. Theſe were followed by another periodical paper, under the title of the Independent Whig; which was continued ſome years after Mr Trenchard's death, by Gordon alone, againſt the hierarchy of the church; but with more acrimony than was ſhown in Cato's Letters. At length Sir Robert Walpole retained him to defend his adminiſtration, to which end he wrote ſeveral pamphlets. At the time of his death, July 28th 1750, he was firſt commiſſioner of the wine licences, an office which he had enjoyed many years. He was twice married. His ſecond wife was the widow of his great friend Trenchard, by whom he had children.—He publiſhed Engliſh tranſlations of Salluſt and Tacitus, with additional diſcourſes to each author, which contain much good matter. Alſo, two collections of his tracts have been preſerved: the firſt entitled, A Cordial for Low-ſpirits, in three volumes: and the ſecond, The Pillars of Prieſtcraft and Orthodoxy ſhaken, in two volumes. But theſe, like many other poſthumous things, had better have been ſuppreſſed. In his tranſlations as well as his other works he places his verbs at the ends of ſentences, according to the Latin idiom, in a very ſtiff and affected manner.

Gordon ‖ Gorey.

GORDONIA, a genus of plants, belonging to the monadelphia claſs. See BOTANY *Index.*

GORE, in *Heraldry*, one of the abatements, which, according to Gullim, denotes a coward. It is a figure conſiſting of two arch lines drawn one from the ſiniſter chief, and the other from the ſiniſter baſe, both meeting in an acute angle in the middle of the feſs point. See HERALDRY.

GOREE, a ſmall iſland of Africa, near Cape de Verd, ſubject to the French. It is a ſmall ſpot not exceeding two miles in circumference, but its importance ariſes from its ſituation for trade ſo near Cape Verd, and it has been therefore a bone of contention between European nations. It was firſt poſſeſſed by the Dutch, from whom, in 1663, it was taken by the Engliſh; but in 1665 it was retaken by the Dutch, and in 1677 ſubdued by the French, in whoſe poſſeſſion it remained till the year 1759, when the Britiſh arms were everywhere triumphant; and it was reduced by Commodore Keppel, but reſtored to the French at the treaty of peace in 1763. It was retaken by the Engliſh in the laſt war, but again reſtored at the peace of 1783. E. Long. 17. 20. N. Lat. 14. 43.

GOREE, the capital town of an iſland of the ſame name in Holland, eight miles ſouth of Briel. E. Long. 3. 50. N. Lat. 51. 55.

GOREY, a borough, fair, and poſt-town in the county of Wexford, province of Leinſter, otherwiſe called *Newborough.* It ſtands about 18 miles north of Wexford town, and 45 from Dublin. N. Lat. 52. 40. W. Long. 6. 30. It ſends two members to parliament; patronage in the family of Ram.

Gorge || Gorgonia.

GORGE, in *Architecture*, the narroweſt part of the Tuſcan and Doric capitals, lying between the aſtragal, above the ſhaft of the pillar, and the annulets.

GORGE, in *Fortification*, the entrance of the platform of any work. See FORTIFICATION.

GORGED, in *Heraldry*, the bearing of a crown, coronet, or the like, about the neck of a lion, a ſwan, &c. and in that caſe it is ſaid, the lion or cygnet is gorged with a ducal coronet, &c.

GORGED is alſo uſed when the gorge or neck of a peacock, ſwan, or the like bird, is of a different colour or metal from the reſt.

GORGET, a kind of breaſt-plate, like a half-moon, with the arms of the prince thereon; worn by the officers of foot. They are to be either gilt or ſilver, according to the colour of the buttons on the uniforms.

GORGET, or GORGERET, in *Surgery*, is the name which the French give to the concave or cannulated conductor, uſed in lithotomy. See SURGERY *Index*.

GORGONA, a ſmall iſland of Italy, in the ſea of Tuſcany, and near that of Corſica, about eight miles in circumference; remarkable for the large quantity of anchovies taken near it. E. Long. 10. 0. N. Lat. 43. 22.

GORGONA, a ſmall iſland of the South ſea, 12 miles weſt of the coaſt of Peru, in America. It is indifferent high land, very woody, and ſome of the trees are very tall and large, and proper for maſts. It is about 10 miles in circumference, and has ſeveral ſprings and rivulets of excellent water, but is ſubject to conſtant rains. W. Long. 79. 3. S. Lat. 30.

GORGONIA, in *Natural Hiſtory*, a genus of zoophytes, which formerly were called *ceratophytons*, and are known in Engliſh by the names of *ſea-fans*, *ſea-feathers*, and *ſea-whips*. Linnæus and Dr Pallas conſider them as of a mixed nature in their growth, between animals and vegetables; but Mr Ellis ſhows them to be true animals of the polype kind, growing up in a branched form reſembling a ſhrub, and in no part vegetable. They differ from the freſh water polype in many of their qualities, and particularly in producing from their own ſubſtance a hard and ſolid ſupport, ſerving many of the purpoſes of the bone in other animals. This is formed from a concreting juice thrown out from a peculiar ſet of longitudinal parallel tubes, running along the internal ſurface of the fleſhy part: in the coats of theſe tubes are a number of ſmall orifices, through which the oſſeous liquor exudes, and concreting, forms the layers of that hard part of the annular circles, which ſome, judging from the conſiſtence rather than the texture, have erroneouſly denominated *wood*. The ſurface of the gorgonia is compoſed of a kind of ſcales, ſo well adapted to each other as to ſerve for defence from external injuries: and the fleſh, or, as ſome have called it, the *bark* or *cortex*, conſiſts of proper muſcles and tendons for extending the openings of their cells; for ſending forth from thence their polype ſuckers in ſearch of food; and for drawing them in ſuddenly, and contracting the ſphincter muſcles of theſe ſtarry cells, in order to ſecure theſe tender parts from danger; and alſo of proper ſecretory ducts, to furniſh and depoſit the oſſeous matter that forms the ſtem and branches as well as the baſe of the bone. Mr Ellis affirms, that there are ovaries in theſe animals, and thinks it very probable that many of them are viviparous. See ZOOPHYTES.

Gorgons || Gorlita.

GORGONS, in *Antiquity* and *Mythology*. Authors are not agreed in the account they give of the Gorgons. The poets repreſent them as three ſiſters, whoſe names were *Stheno*, *Euryale*, and *Meduſa*; the latter of whom was mortal, and, having been deflowered by Neptune, was killed by Perſeus; the two former were ſubject neither to age nor death. They are deſcribed with wings on their ſhoulders, with ſerpents round their heads, their hands were of braſs, and their teeth of a prodigious ſize, ſo that they were objects of terror to mankind. After the death of Meduſa, her ſiſters, according to Virgil, were appointed to keep the gate of the palace of Pluto.

Multaque præterea variarum monſtra ferarum—
GORGONES, Harpyiæque——

Diodorus Siculus will have the Gorgons and Amazons to have been two warlike nations of women, who inhabited that part of Libya which lay on the lake Tritonidis. The extermination of theſe female nations was not effected till Hercules undertook and performed it.

Pauſanias ſays, the Gorgons were the daughters of Phorbus; after whoſe death, Meduſa, his daughter, reigned over the people dwelling near the lake Tritonidis. The queen was paſſionately fond of hunting and war, ſo that ſhe laid the neighbouring countries quite waſte. At laſt, Perſeus having made war on them, and killed the queen herſelf, when he came to take a view of the field of battle, he found the queen's corpſe ſo extremely beautiful, that he ordered her head to be cut off, which he carried with him to ſhow his countrymen the Greeks, who could not behold it without being ſtruck with aſtoniſhment.

Others repreſent them as a kind of monſtrous women, covered with hair, who lived in woods and foreſts. Others, again, make them animals, reſembling wild ſheep, whoſe eyes had a poiſonous and fatal influence.

GORITIA, or GORITZ, a ſtrong town of Germany, in the circle of Auſtria, and duchy of Carniola, with a caſtle; ſeated on the river Lizonzo, 20 miles north-eaſt of Aquileia, and 70 north-eaſt of Venice. E. Long. 13. 43. N. Lat. 46. 12.

GORLÆUS, ABRAHAM, an eminent antiquary, was born at Antwerp, and gained a reputation by collecting medals and other antiques. He was chiefly fond of the rings and ſeals of the ancients, of which he publiſhed a prodigious number in 1601, under this title, *Dactyliotheca; ſive Annulorum Sigillarium, quorum apud priſcos tam Græcos quam Romanos uſus ex ferro, ære, argento, et auro, Promptuarium.* This was the firſt part of the work: the ſecond was entitled, *Variarum Gemmarum, quibus antiquitas in ſignando uti ſolita ſculpturæ.* This work has undergone ſeveral editions, the beſt of which is that of Leyden, 1695: for it not only contains a vaſt number of cuts, but alſo a ſhort explication of them by Gronovius. In 1680, he publiſhed a collection of medals: which, however, if we may believe the *Scaligerana*, it is not ſafe always to truſt. Gorlæus pitched upon Delft for the place of his reſidence, and died there in 1609. His collections of antiques were ſold by his heirs to the prince of Wales.

GORLITZ, a town of Germany, in Upper Luſatia, ſubject

Gorlitz || Goſſamer.

ſubject to the elector of Saxony. It is a handſome ſtrong place, and ſeated on the river Neiſſe, in E. Long 15. 15. N. Lat. 51. 10.

GORTERIA, a genus of plants belonging to the ſyngeneſia claſs, and in the natural method ranking under the 49th order, *Compoſitæ*. See BOTANY *Index*.

GOSHAWK. See FALCO, ORNITHOLOGY *Index*.

GOSHEN, in *Ancient Geography*, a canton of Egypt, which Joſeph procured for his father and his brethren when they came to dwell in Egypt. It was the moſt fruitful part of the country: and its name ſeems to be derived from the Hebrew, *Geſhem*, which ſignifies "rain;" becauſe this province lying very near the Mediterranean, was expoſed to rains, which were very rare in other cantons, and more eſpecially in Upper Egypt. Calmet does not queſtion but that Goſhen, which Joſhua (x. 41. xi. 16. xv. 51.) makes part of the tribe of Judah, is the ſame as the land of Goſhen, which was given to Jacob and his ſons by Pharaoh king of Egypt; (Gen. xlvi. 28.). It is certain that this country lay between Paleſtine and the city of Tanais, and that the allotment of the Hebrews reached ſouthward as far as the Nile, (Joſh. xiii. 3.).

GOSLAR, a large and ancient town of Lower Saxony, and in the territory of Brunſwick: it is a free imperial city, and it was here that gunpowder was firſt invented, by a monk as is generally ſuppoſed. It is a large place, but the buildings are in the ancient taſte. In 1728, 280 houſes, and St Stephen's fine church, were reduced to aſhes. It is ſeated on a mountain, near the river Goſe, and near it are rich mines of iron. The inhabitants are famous for brewing excellent beer. E. Long. 10. 26. N. Lat. 51. 55.

GOSPEL, the hiſtory of the life, actions, death, reſurrection, aſcenſion, and doctrine of Jeſus Chriſt.—The word is Saxon, and of the ſame import with the Latin term *evangelium*, which ſignifies "glad tidings," or "good news."

This hiſtory is contained in the writings of St Matthew, St Mark, St Luke, and St John; who from thence are called *evangeliſts*. The Chriſtian church never acknowledged any more than theſe four goſpels as canonical; notwithſtanding which, ſeveral apocryphal goſpels are handed down to us, and others are entirely loſt.

GOSPORT, a town of Hampſhire, 79 miles from London, in the pariſh of Alverſtock. It has a ferry over the mouth of the harbour to Portſmouth, and is a large town and of great trade, eſpecially in time of war. Travellers chooſe to lodge here, where every thing is cheaper and more commodious for them than at Portſmouth. The mouth of the harbour, which is not ſo broad here as the Thames at Weſtminſter, is ſecured on this ſide by four forts, and a platform of above 20 cannon level with the water. Here is a noble hoſpital built for the cure of the ſick and wounded ſailors in the ſervice of the navy; beſides a free ſchool.

GOSSAMER is the name of a fine filmy ſubſtance, like cobwebs, which is ſeen to float in the air, in clear days in autumn, and is more obſervable in ſtubble-fields, and upon furze and other low buſhes. This is probably formed by the flying ſpider, which, in traverſing the air for food, ſhoots out theſe threads from its anus, which are borne down by the dew, &c.

GOSSYPIUM, or COTTON, a genus of plants belonging to the monadelphia claſs, and in the natural method ranking under the 37th order, *Columniferæ*. See BOTANY *Index*. Goſſypium, Gotha.

The American iſlands produce cotton ſhrubs of various ſizes, which riſe and grow up without any culture; eſpecially in low and marſhy grounds. Their produce is of a pale red; ſome paler than others; but ſo ſhort that it cannot be ſpun. None of this is brought to Europe, though it might be uſefully employed in making of hats. The little that is picked up, ſerves to make mattreſſes and pillows.

The cotton-ſhrub that ſupplies our manufactures, requires a dry and ſtony ſoil, and thrives beſt in grounds that have already been tilled. Not but that the plant appears more flouriſhing in freſh lands than in thoſe which are exhauſted; but while it produces more wood, it bears leſs fruit.

A weſtern expoſure is fitteſt for it. The culture of it begins in March and April, and continues during the firſt ſpring-rains. Holes are made at ſeven or eight feet diſtance from each other, and a few ſeeds thrown in. When they are grown to the height of five or ſix inches, all the ſtems are pulled up, except two or three of the ſtrongeſt. Theſe are cropped twice before the end of Auguſt. This precaution is the more neceſſary, as the wood bears no fruit till after the ſecond pruning; and, if the ſhrub was ſuffered to grow more than four feet high, the crop would not be the greater, nor the fruit ſo eaſily gathered. The ſame method is purſued for three years; for ſo long the ſhrub may continue, if it cannot conveniently be renewed oftener with the proſpect of an advantage that will compenſate the trouble.

This uſeful plant will not thrive if great attention is not paid to pluck up the weeds that grow about it. Frequent rains will promote its growth; but they muſt not be inceſſant. Dry weather is particularly neceſſary in the months of March and April, which is the time of gathering the cotton, to prevent it from being diſcoloured and ſpotted.

When it is all gathered in, the ſeeds muſt be picked out from the wool with which they are naturally mixed. This is done by means of a cotton-mill; which is an engine compoſed of two rods of hard wood, about 18 feet long, 18 lines in circumference, and fluted two lines deep. They are confined at both ends, ſo as to leave no more diſtance between them than is neceſſary for the ſeed to ſlip through. At one end is a kind of little millſtone, which, being put in motion with the foot, turns the rods in contrary directions. They ſeparate the cotton, and throw out the ſeed contained in it.

GOTHA, a town of Germany, in the circle of Upper Saxony, and capital of the duchy of Saxe-Gotha, in E. Long. 10. 40. N. Lat. 50. 57. Some fancy this town had its name from the Goths, and that they fortified it in their march to Italy; but it was only a village till ſurrounded with walls by the biſhop of Mentz in 964. It is ſituated in a fine plain on the river Leina well built and ſtrongly fortified. Here are two handſome churches and a very good hoſpital. Its chief trade is in dyers weed, of which they have three crops, but the third grows wild. The neighbouring country produces a vaſt deal of corn. The caſtle or ducal palace

Gothard
||
Goths.

of Gotha was rebuilt in the 16th century by duke Erneſt, ſurnamed *the Pious*, who cauſed both that and the town to be encompaſſed with ditches and ramparts; and gave it the name of *Friedenſtein*, or the *Caſtle of Peace*, in oppoſition to its ancient name of *Grimmerſtein*, or the *Caſtle of the Furies*. It is ſituated on a neighbouring eminence, from whence there is a vaſt proſpect of a fruitful plain. In one of the apartments there is a collection of valuable rarities, and a noble library.

The dukedom of Saxe Gotha is about 30 miles long, and 12 broad. The reigning duke is Lewis Erneſt, born in 1745, and married to the princeſs Maria Charlotte of Saxe Meningen, by whom he has iſſue. He is the head of the Erneſtine line of Saxony, deſcended from the elector John Frederick the Magnanimous, who was deprived of the electorate by the emperor Charles V. in 1574; ſince which the youngeſt branch called the *Albertine* has enjoyed it. He has ſeveral other principalities beſides that of Saxe Gotha; and his revenues are computed at 200,000l. a-year, with which he maintains about 3000 regular troops. As he is the moſt powerful of all the Saxon princes of the Erneſtine branch; ſo of all the courts of Saxony, next to that of Dreſden, he has the moſt numerous and the moſt magnificent. His guards are well clothed, his liveries rich, and his tables ſerved with more elegance than profuſion. And yet by the prudent management of his public finances, his ſubjects are the leaſt burdened with taxes of any ſtate in Germany. The religion is Lutheran.

GOTHARD, one of the higheſt mountains of Switzerland; and from the top, where there is an hoſpital for monks, is one of the fineſt proſpects in the world. It is eight miles from Aldorf.

GOTHEBORG, GOTHENBURG, or *Gottenburg*. See GOTTENBURG.

GOTHIC, in general, whatever has any relation to the Goths: thus we ſay, Gothic cuſtoms, Gothic architecture, &c. See ARCHITECTURE.

GOTHLAND, the moſt ſouthern province of Sweden, being a peninſula, encompaſſed on three ſides by the Baltic ſea, or the channel at the entrance of it. It is divided into ſeveral parts, which are, Eaſt Gothland, Weſt Gothland, Smaland, Halland, Bleaking, and Schonen. It was a long time in the poſſeſſion of the kings of Denmark, but was ceded to Sweden in 1654. The principal towns of Gothland are Calmar, Landſcroon, Chriſtianople, Daleburg, Gothenburgh, Helmſtat, Lunden, Malmone, and Vexio.

GOTHS, a warlike nation, and above all others famous in the Roman hiſtory, came originally out of Scandinavia (the name by which the ancients diſtinguiſhed the preſent countries of Sweden, Norway, Lapland, and Finmark). According to the moſt probable accounts they were the firſt inhabitants of thoſe countries; and from thence ſent colonies into the iſlands of the Baltic, the Cimbrian Cherſoneſus, and the adjacent places yet deſtitute of inhabitants. The time of their firſt ſettling in Scandinavia, and the time when they firſt peopled with their colonies the above-mentioned iſlands and Cherſoneſus, are equally uncertain; though the Gothic annals ſuppoſe the latter to have happened in the time of Serug the great grandfather of Abraham. This firſt migration of the Goths is ſaid to have been conducted by their king Eric; in which all the ancient Gothic chronicles, as well as the Daniſh and Swediſh ones, agree. Their ſecond migration is ſuppoſed to have happened many ages after; when, the above-mentioned countries being overſtocked with people, Berig, at that time king of the Goths, went out with a fleet in queſt of new ſettlements. He landed in the country of the Ulmerugians, now Pomerania, drove out the ancient inhabitants, and divided their lands among his followers. He fell next upon the Vandals, whoſe country bordered on that of the Ulmerugians, and overcame them; but inſtead of forcing them to abandon their country, he only made them ſhare their poſſeſſions with the Goths. Goths.

The Goths who had ſettled in Pomerania and the adjacent parts of Germany being greatly increaſed, inſomuch that the country could no longer contain them, they undertook a third migration in great numbers, under Filimer ſurnamed the *Great*, the fifth prince after leaving Scandinavia; and taking their route eaſtward, entered Scythia, advanced to the Cimmerian Boſphorus, and driving out the Cimmerians, ſettled in the neighbourhood of the Palus Mæotis. Thence in proceſs of time, being greatly increaſed in Scythia, they reſolved to ſeek new ſettlements; and accordingly taking their route eaſtward, they traverſed ſeveral countries, and at length returned into Germany.

Their leader in this expedition was the celebrated Woden, called alſo *Voden*, *Othen*, *Oden*, *Godan*, and *Guadan*. Of this Woden many wonderful things are related in the Sueo-gothic chronicles. He was king of the Aſgardians, whom the northern writers will have to be the ſame with a people called *Aſpurgians* mentioned by Strabo and Ptolemy. By Strabo they are placed near the Cimmerian Boſphorus. Aſpurgia was the metropolis of a province which Strabo calls *Aſia*; and Woden and his followers are ſtyled by the ancient Gothic writers *Aſæ*, *Aſianæ*, and *Aſiotæ*. The kings of Aſpurgia were maſters of all that part of Scythia which lay to the weſtward of Imaus, and was by the Latins called *Scythia intra Imaum*, or "Scythia within Imaus."

At what time Woden reigned in this country, is quite uncertain; but all hiſtorians agree, that he went out in queſt of new ſettlements with incredible numbers of people following him. He firſt entered Roxolania, comprehending the countries of Pruſſia, Livonia, and great part of Muſcovy. From thence he went by ſea into the north parts of Germany; and having reduced Saxony and Jutland, he at laſt ſettled in Sweden, where he reigned till his death, and became ſo famous that his name reached all countries, and he was by the northern nations worſhipped as a god. He is ſuppoſed to have brought with him the Runic characters out of Aſia, and to have taught the northern nations the art of poetry; whence he is ſtyled the father of the Scaldi or Scaldri, their poets, who deſcribed in verſe the exploits of the great men of their nation, as the bards did among the Gauls and Britons.

The Romans diſtinguiſhed the Goths into two claſſes; the Oſtrogoths and Viſigoths. Theſe names they received before they left Scandinavia, the *Viſigoths* being

Goths. ing ſoftened by the Latins from *Weſterogoths*, or thoſe who inhabited the weſtern part of Scandinavia, as the Oſtrogoths were thoſe who inhabited the eaſtern part of that country. Their hiſtory affords nothing of moment till the time of their quarrelling with the Romans; which happened under the reign of the emperor Caracalla, ſon to Severus. After that time their hiſtory becomes ſo cloſely interwoven with that of the Romans, that for the moſt remarkable particulars of it we muſt refer to the article ROME. After the deſtruction of the Roman empire by the Heruli, the Oſtrogoths, under their king Theodoric, became maſters of the greateſt part of Italy, having overcome and put to death Odoacer king of the Heruli in 494. They retained their dominion in this country till the year 553; when they were finally conquered by Narſes, the emperor Juſtinian's general. See (Hiſtory of) ITALY. The Viſigoths ſettled in Spain in the time of the emperor Honorius, where they founded a kingdom which continued till the country was ſubdued by the Saracens. See SPAIN.

The Goths were famous for their hoſpitality and kindneſs to ſtrangers, even before they embraced the Chriſtian religion. Nay, it is ſaid, that from their being eminently good, they were called *Goths*, by the neighbouring nations; that name, according to Grotius and moſt others writers, being derived from the German word *goten*, which ſignifies "good." They encouraged, ſays Dio, the ſtudy of philoſophy above all other barbarous or foreign nations, and often choſe kings from among their philoſophers. Polygamy was not only allowed but countenanced among them; every one being valued or reſpected according to the number of his wives. By ſo many wives they had an incredible number of children, of whom they kept but one at home, ſending out the reſt in queſt of new ſettlements; and hence thoſe ſwarms of people which overran ſo many countries. With them adultery was a capital crime, and irremiſſibly puniſhed with death. This ſeverity, and likewiſe polygamy, prevailed among them when they were known to the Romans only by the name of *Getæ* (their moſt ancient name); as appears from the poet Menander, who was himſelf one of that nation; and from Horace, who greatly commends the chaſtity of their women. Their laws fell little ſhort of thoſe of the ancient Romans. Their government was monarchical; their religion was much the ſame with that of the ancient Germans or Celtes; and their dreſs is deſcribed by Apollinaris Sidonius in the following words: "They are ſhod (ſays he) with high ſhoes made of hair, and reaching up to their ankles; their knee, thighs, and legs, are without any covering; their garments of various colours ſcarce reaching to the knee; their ſleeves only cover the top of their arms; they wear green caſſocks with a red border; their belts hang on their ſhoulders; their ears are covered with twiſted locks; they uſe hooked lances and miſſile weapons." Goths.

END OF THE NINTH VOLUME.

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